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VISUAL ACUITY WITHIN THE AREA CENTRALIS AND ITS RELATION TO EYE MOVEMENTS AND FIXATION

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Using an arrangement of the Ives visual acuity test with other special apparatus which is described, three subjects were studied as to the visual acuity of a central retinal region (including the fovea) with a radius of 85′ or 0.42 millimeter from the axis of fixation. A uniform sensory gradient in the light adapted eye was shown to exist, the visual acuity decreasing rapidly but regularly in all directions without breaks or marked variations in rate of change at the margins of any known anatomical areas. The gradient continued to the very center of the retina. The horizontal and vertical meridians showed different rates of decrease of visual acuity. The results support the view that the sensory gradient is the basic factor in eye movements and fixation. From the Department of Physiology, Stanford University.

Our object was to determine the regional visual acuity within and near the area centralis and, if possible, its relationship to the other topographical features of this part of the retina.

The general features of the variation of visual acuity with place in the retina have long been known. The early work, such as that of Fick[13], was followed by the careful determinations of Wertheim in 1894[27], which have remained standard. The latter used grids of various sizes on a perimeter at one meter. This method, involving accommodation and variations in the area stimulated, has obvious limitations, and, until the advent of more refined technique, detailed acquaintance with the acuity of the important central region was impossible.

Even at the present time, however, search in the literature fails to show any data on the variations of acuity within the area centralis. Marx and Trendelenburg[22] and others have lamented this deficiency. Wertheim's data include the nearest determinations, namely, at fixation and at 2° 30′, but this actually gives only one value for the area centralis, since the second point falls outside at a distance almost twice that covered by the present investigation. Burchardt[6] gives acuities within an excentricity of 1°, but as these were made with test cards of dots of indeterminate angular size and separation on an ordinary perimeter they are of little value. Aubert[1] tested the perception of motion at excentricities including 15′ and 1° 15′. In the pages that follow we give our method in some detail, since the accuracy of these determinations rests so largely on the technique employed.

Apparatus and conditions: The right eye of each of three subjects, W., Wh., and R., was tested with the Ives visual acuity object. This instrument exhibits through a circular aperture of six cm. diameter a field of alternate black and white lines. These lines are interference bands formed by two gratings illuminated from behind. By rotating the gratings one on the other the angle formed by the two rulings may be altered and therefore the width of the interference bands. By rotating the frame carrying the gratings, the direction of the lines may be changed. Alterations in the width of the lines do not change the total amount of light transmitted; therefore the average

brightness of the test field remains constant.

This method of producing lines of variable width has been utilized by Johnson[20] and by Miles[4]. The latter states that it was first described by Behn[3]. The form of the instrument used by us is that devised by Ives[16, 17, 18] and manufactured by the Bausch and Lomb Optical Company. It is provided with scales giving directly the visual acuity at six meters and at submultiples of this distance.

It has long been customary in ophthalmology to use for visual acuity a scale based on the standard adopted by Snellen in which a visual angle of one minute for each line or space is considered normal. The acuity is then taken as the reciprocal of the visual angle threshold expressed in minutes. We have used this method in the present paper because it is customary, but have also given the actual visual angle thresholds for comparison. It seems clear, however, that this method of expressing acuity is incorrect. As pointed out by Sterling and his coworkers[25], Snellen used the familiar fractions (20/20, 20/40, and so on) as descriptive of the conditions of the test and not as a measure of the acuity, and for this reason objected to the use of the decimals derived from them. Sterling devised "meshed glasses" which reduced the acuity by known amounts, and from the effect of these worn in combination he concluded that the relation between the visual angle and the true acuity was an exponential one: this corresponds to the logarithmic scale of acuity used in figure 1, which was independently adopted for an entirely different reason.

The instrument was calibrated directly, the distance from the center of one line to the center of the next being measured with calipers. Since by definition the visual acuity is the reciprocal of the separation of the lines, the product of the scale readings and the corresponding measurements of the lines should be constant. This proved not to be true, but on reduction of each scale reading by 0.02 a constant was obtained. This assumes that the error lay in the position of the entire scale on the instrument. In our determinations the readings were made on the six-meter scale reduced to twenty-one meters (the distance at which used) and corrected for the above error so that they represent the true reciprocals of the thresholds in minutes. The intervals at which the test object was set were one-thirtieth (one-third of the interval between the tenth marks) on the six-meter scale, corresponding to an interval in visual acuity at twenty-one meters of about 0.1. These were found to be as small intervals as could be set with any degree of accuracy on the scale.

The test object was installed in a small room at the end of a corridor, and at a convenient distance (1.61 m.) from the door. In the door was cut a round hole of six cm. diameter through which the lines were exposed. This door was faced with light grey strawboard of a slight yellow cast. The screen thus formed served the same purpose as that used by Miles to eliminate clues given to the direction of the lines by the oblique meeting of the lines and the circular opening of the instrument in which they are framed. At the distance used no trace of the tell-tale "steps" could be noted. The walls of the corridor were whitewashed, and the illumination was entirely artificial, coming from a series of 200-watt gas-filled bulbs so shaded that none of the direct light fell on the subject who sat in the corridor facing the test object. A headrest maintained his eye at exactly twenty-one meters from the test object.

Only the right eye was used in judging. A screen of white cardboard adjusted to the general illumination was placed about twelve inches in front of the left eye in such a position as to conceal the test object from that eye but not from the right. While assuring monocular judgment of the object, such an arrangement prevented any tendency for dark adaptation. The eyes were tested, particularly for astig-

matism, and correcting glasses were used where necessary.

Between screen and test object was installed a pendulum faced with the same material as the screen. The velocity of the pendulum was ascertained by attaching to it a smoked paper and allowing it to swing past a tuning fork to which a stylus was attached. A gap was cut in the pendulum sufficiently wide to allow exposure of the test object for 0.1 second as the pendulum swung.

The illumination of the pendulum was from the side, so that when it swung the grating of the test object received no light from in front. The brightness of the pendulum was adjusted until at the distance of twenty-one meters the part of the pendulum exposed through the orifice in the screen was practically indistinguishable from the screen itself. Thus the screen presented as nearly as possible a uniform field for the subject's eye.

The test object was constant in position, while the fixation point, consisting of a black button of about one centimeter diameter, was varied along two meridians—horizontal and vertical—intersecting at the center of the test object. This caused images of the test object to fall along the horizontal and vertical meridians of the retina having as their pole the axis of fixation.

The fixation points were at intervals of six centimeters, starting from the center of the orifice in the screen. As the diameter of this orifice was six centimeters, the circular images made on the retina by the test object at consecutive points of fixation were tangent.

Factors in visual acuity: Among the factors affecting monocular visual acuity may be included the following [28, 9, 10]:

A. Factors concerning the eye:
   1. Sensibility of retina, varying with
      a. Age and sex.
      b. Retinal adaptation[13].
      c. Topography of retina[27].
   2. Refractive condition of the eye, varying with
      a. Age and sex.
      b. Refractive errors.
   3. Pupillary diameter.
   4. Eye movements[2].

B. Factors concerning the stimulus [9, 10].
   1. Size of test object.
   2. Type of test object.
   3. Brightness of general illumination[21].
   4. Contrast between object and background.
   5. Time of exposure of object.
   6. Wave length of light used.

For a particular portion of the retina of an individual eye, discrimination would depend, therefore, on the six external factors, four of which have recently been emphasized by Cobb[10]. In the present work, where regional variations of sensitivity were under investigation, all external factors except size of detail of test object were kept constant; the same instrument was used throughout; controlled artificial light was used, giving constant general illumination and consequently constant pupillary size and state of adaptation; the contrast was constant for the instrument; the time of exposure was kept constant at 0.1 second; and the source of illumination, and therefore the wave length, was unchanged throughout.

The brightness of the screen and walls was 14 to 15 millilamberts; that of the test object was 17.9 ml. Since an illumination of ten to fifteen foot-candles is considered adequate for even such exacting work as drafting[7], and since white paper reflects about eighty per cent of incident light, the highest brightnesses encountered under exceptional artificial illumination would not exceed 8 to 13 ml., which is definitely less than the present level. Interior daylight may, however, exceed the intensity used, since it is stated to range from 4 to 32 ml.

The general illumination of the corridor was actually but little different from that to which the subject had previously been exposed; nevertheless a preliminary exposure of five minutes

for adaptation to the observing conditions was allowed as a precaution.

The limitation of the exposure to 0.1 second precluded eye movements[11] which would have had two disturbing effects: (1) a change in fixation and consequently in the location of the image on the area centralis; and (2) an increase in acuity due to movement of the image[2].

Experimental procedure: The lines of the test object were exposed in four different directions: horizontal, vertical, and right and left oblique.

With a given fixation point, the test object was set with the lines a given distance apart and in a given axis, and the pendulum was swung. The subject gave his judgment as to the direction of the lines, classing it as "certain" or "uncertain", or as "unknown". The separations and directions of the lines were changed in irregular order; but equal numbers at each separation and direction were given.

After a little experience the critical range of settings with a given fixation point could be forecast rather closely. In this range five judgments were recorded for each of the four positions of the test object at each of the scale settings used. On an average, three settings of the scale included the critical range, four out of five correct "certains" and four out of five "unknowns" being considered satisfactory limits.

An inherent source of variability is the difficulty of maintaining accurate fixation, particularly with small degrees of excentricity. Fatigue was found to be such an important factor that only short periods of observation were employed, with ample rest between. The best proof of the care taken on these points is that the variations, and consequently the probable errors, of the results are as small as they are.

For each eye the acuity was determined for thirty-three retinal areas: for that surrounding the axis of fixation and for eight tangent areas on each side in the horizontal and vertical meridians. This covers a field about 2° 50′, or 0.84 mm., in diameter. Previous determination on W. gave the following data: rod-free area, horizontal diameter 0.789 mm., vertical diameter, 0.740 mm.; pigmented area, 0.66 mm. (average); nonvascular area, horizontal diameter 0.52 mm., vertical diameter 0.535 mm. Whether the general field tested is concentric with any or all of those mentioned above can not, of course, be determined.

The total number of judgments given for each area was approximately sixty, and the total number for each eye two thousand.

In arriving at the acuity for each area tested, the judgments were scored as follows: each correct "certain" was counted as two points, each correct "uncertain" as one point, and each "unknown" or incorrect judgment as 0. This seemed as simple a method as was practicable. It is open to the criticism that if correct guesses count, incorrect guesses should discount. As the incorrect guesses were very few in number and the incorrect certains still fewer, their omission did not appreciably affect the result. On this basis then a score of five in five trials was considered the fifty per cent mark, or the threshold acuity. This median and its probable error were determined by customary methods.

For calculation of the size of retinal images and visual angles, the following method was used[26]:

Let

x = distance of object from first focal point,

y = size of object

y' = size of retinal image

ω_f = angle in radians subtended by object at first nodal point and by image at second nodal point,

and

F = refractive power of eye (58.64 D. for Gullstrand's schematic eye).

Then

$$y'\left(F-\frac{1}{x}\right)=\frac{y}{x}=\omega_f$$

and

$$y' = \frac{y}{x\left(F - \frac{1}{x}\right)} =$$

approximately $\frac{y}{xF}$

In this case, for the test object $x = 21$ m., while for the screen $x = 19.39$ m. On this basis the subject's visual angle for the test object and also for the interval between successive fixation points was 10.64′, which corresponds to a retinal distance of 0.05277 mm.

The size of retinal image corresponding to a visual angle of 1′ is 4.96 microns. The maximum average axial acuity (determined by fixing the test object) was found to be 1.54 (in the case of W.), in which case the distance from the center of the image of a black line to that of the adjacent white line would be 3.22 microns. It is interesting to compare this figure with that of Fritsch[14], who gives the average interconal distance as about 3 microns!

Results and discussion: Although a greater number of observations would undoubtedly give a more completely representative curve of acuity, the

TABLE 1

Visual acuity and threshold for each part of visual field tested (W).

Excentricity	Direction of lines of test object				Average for all directions	
	right oblique acuity	left oblique acuity	vertical acuity	horizontal acuity	acuity P.E.	threshold seconds
Direct fixation						
0′	1.53	1.44	1.63	1.56	1.54 ± 0.0057	39.0
Nasal meridian						
10.64′	1.60	1.30	1.67	1.54	1.53 ± 0.0063	39.2
21.27′	1.38	1.08	1.38	1.53	1.34 ± 0.0101	44.8
31.91′	1.28	1.14	1.30	1.42	1.29 ± 0.0073	46.5
42.54′	1.12	1.05	1.17	1.26	1.15 ± 0.0050	52.2
53.18′	1.08	1.03	1.17	1.24	1.13 ± 0.0057	53.1
63.82′	1.01	0.98	1.05	1.17	1.05 ± 0.0050	57.1
74.46′	0.92	0.92	0.94	1.17	0.99 ± 0.0066	60.6
85.08′	0.92	0.91	0.92	1.05	0.95 ± 0.0049	63.2
Temporal meridian						
10.64′	1.40	1.49	1.65	1.49	1.51	39.7
21.27′	1.28	1.35	1.38	1.50	1.38	43.5
31.91′	1.30	1.30	1.42	1.51	1.38	43.5
42.54′	1.17	1.23	1.30	1.37	1.27	47.2
53.18′	1.24	1.21	1.24	1.35	1.26	47.6
63.82′	0.99	0.96	1.07	1.26	1.07	56.1
74.46′	0.99	0.94	1.01	1.19	1.03	58.3
85.08′	0.94	0.99	0.98	1.10	1.00	60.0
Inferior meridian						
10.64′	1.37	1.28	1.56	1.53	1.44	41.7
21.27′	1.30	1.08	1.38	1.19	1.24	48.4
31.91′	1.03	1.08	1.17	1.15	1.11	54.1
42.54′	0.89	0.78	0.99	0.96	0.91	65.9
53.18′	0.82	0.82	1.05	0.87	0.89	67.4
63.82′	0.76	0.73	0.92	0.78	0.80	75.0
74.46′	0.71	0.69	0.75	0.71	0.72	83.3
85.08′	0.59	0.64	0.70	0.70	0.66	90.9
Superior meridian						
10.64′	1.38	1.47	1.53	1.44	1.46	41.2
21.27′	1.33	1.26	1.53	1.31	1.36	44.1
31.91′	1.05	1.24	1.30	1.28	1.22	49.2
42.54′	0.94	0.97	1.12	1.08	1.03	58.3
53.18′	0.83	0.91	0.96	0.96	0.92	65.2
63.82′	0.83	0.94	0.96	0.94	0.92	65.2
74.46′	0.69	0.75	0.91	0.85	0.80	75.0
85.08′	0.67	0.73	0.73	0.78	0.73	82.2

TABLE 2

Table giving for all three subjects the average visual acuity and threshold at each distance from the axis of fixation.

Excentricity of center of area tested		Average of all meridians					
		W		Wh		R	
angular distance minutes	retinal distance mm.	acuity	seconds	acuity	seconds	acuity	seconds
0	0	1.54	39.0	1.45	41.4	0.98	61.2
10.64	0.0528	1.49	40.3	—	—	—	—
21.27	0.1055	1.33	45.1	1.19	50.4	0.77	77.9
31.91	0.1583	1.25	48.0	1.12	53.6	0.82	73.2
42.54	0.2111	1.09	55.5	1.02	58.8	0.72	83.3
53.18	0.2639	1.05	57.2	0.94	63.8	0.73	82.2
63.82	0.3166	0.96	62.5	0.81	74.1	0.67	89.6
74.46	0.3694	0.89	67.5	0.78	76.9	0.54	111.1
85.08	0.4222	0.83	72.3	0.66	90.9	0.51	117.7

present data, which are more extensive and accurate than those previously available, seem to show conclusively several important features.

First: The area centralis shows a uniform sensory gradient essentially similar to that for the entire retina as determined by Wertheim[27]. This is clearly shown in figure 1, and by comparison of figures 5 and 6.

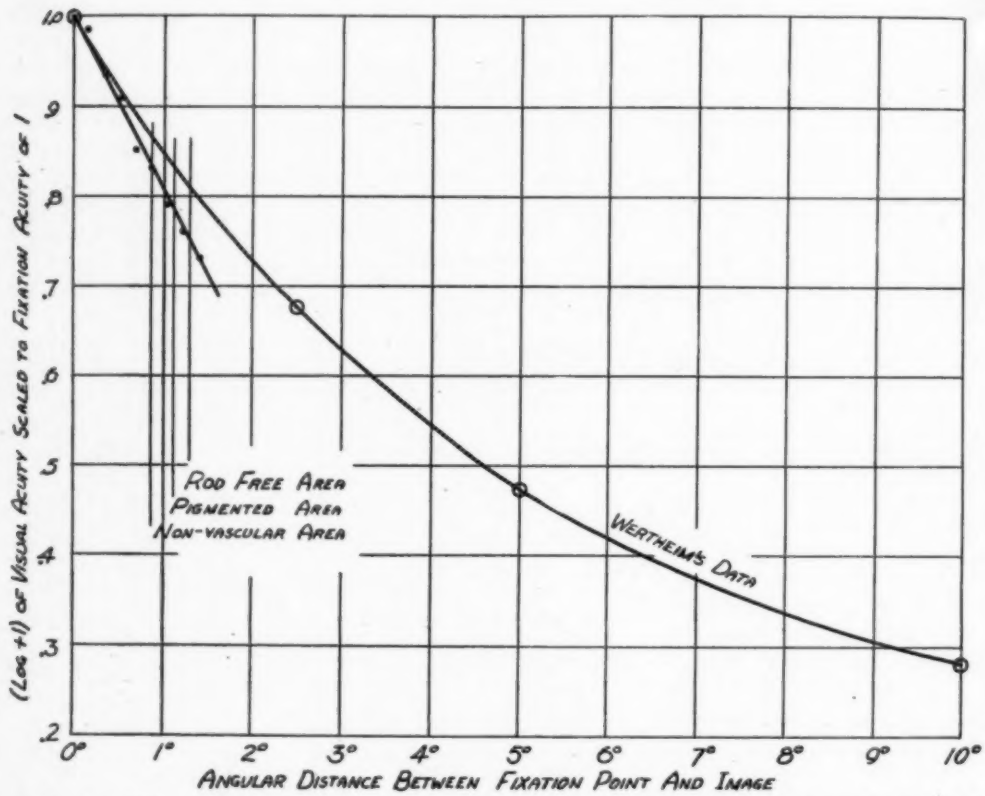

Fig. 1. (Weymouth). Comparison of Wertheim's data on central visual acuity (circles) with those of W. in the present work (points). The boundaries of the nonvascular, pigmented, and rod-free areas of W. are indicated. The ordinates represent the logarithms of the visual acuities scaled to a fixation value of unity for comparison.

The peripheral decline of acuity is without apparent breaks or changes, but forms a continuous gradient on which the anatomical margins of the fovea or other central areas are not indicated. In other words, the margins of the rod-free area, of the pigmented area (macula), and of the nonvascular area are not reflected in the acuity, whatever other physiological relations may be shown for them. We must conclude that, as far as acuity is concerned, foveal and extrafoveal photopic or light-adapted vision are basically the same. The angular limits of "central acuity" can be set only arbitrarily.

Second: The gradient is a continuous one from a sharp maximum at the axis of fixation (presumably the center of the fovea); and points separated radially by as little as 10.64′ or 0.0528 mm. show distinct differences of acuity. The general averages of the three subjects are shown in figure 2.

It must be recalled that successive points of fixation caused images of the test object to fall on the retina in the form of tangent circles of 52.77 microns diameter along the horizontal and vertical meridians. Each determination, although plotted as a point, tests, then, the acuity of a circular area of about 0.002187 sq.mm. or 2187 sq. microns, and containing about 227 cones.

Whether the acuity represents in each case the average or the maximum sensitivity of the area cannot, of course, be determined. If it is the average, the results tend to be smoothed, a process which would reduce the sharpness of the central peak. If it is the maximum, as seems more probable, then we are testing in each area the portion nearest the axis of fixation, and the first excentric determination is in reality more nearly at 5′ from the axis of fixation than at 10.64′ (corresponding to the center of the area).

The net effect in such a case is to necessitate plotting each determination approximately 5′ nearer the axis of fixation. The relation between the peripheral points or areas is not seri-

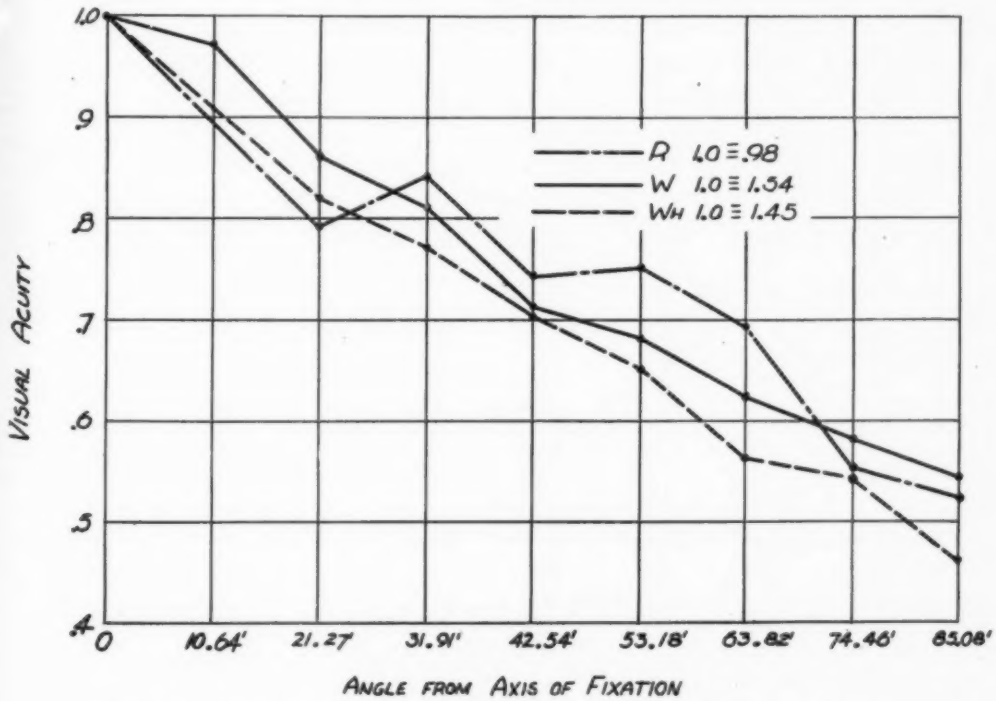

Fig. 2 (Weymouth). The average acuity of the three subjects scaled to a fixation acuity of unity for comparison.

ously changed, but the first interval, between fixation and 10.64′, is reduced by almost half. As the first peripheral value is plotted at 10.64′, the apparent sharpness of the peak in acuity at fixation is less than it probably should be. This peak has important bearings on the relation of the sensory gradient to eye movements and fixation, as will be pointed out later.

error of ± 0.0076. Probable errors and their relative magnitude for the nasal meridian of W. are shown on the curve in figure 3. This meridian is entirely characteristic and shows a much flatter gradient than either of the two vertical meridians.

The most difficult comparison is that of fixation and a point 10.64′ excentric.

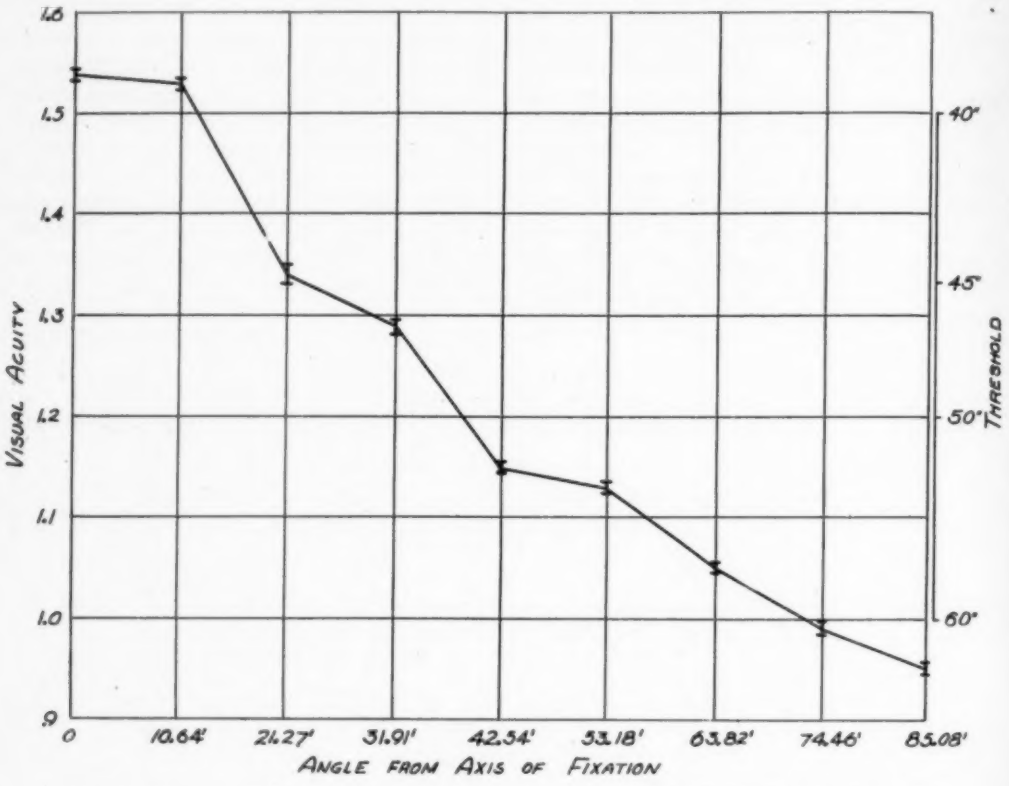

Fig. 3 (Weymouth). Acuity for the nasal meridian of W.'s visual field with the probable errors of each determination.

Successive determinations seem in most instances to be significantly different. Thus points at 53+′ and 64+′ on the smoother of the less sharp gradients for W. show a difference in visual acuity of 0.08 with a probable

W. was the only subject who felt that he could satisfactorily maintain fixation at that slight excentricity, the angular nearness of the test object being too distracting for the less experienced subjects. Such a comparison

TABLE 3

Position of test object	Fixation acuity	10.64′ acuity	Difference	P.E. of difference
Nasal	1.54	1.53	0.01	±0.0084
Temporal	1.54	1.51	0.03	±0.0087
Inferior	1.54	1.44	0.10	±0.0093
Superior	1.54	1.46	0.08	±0.0089

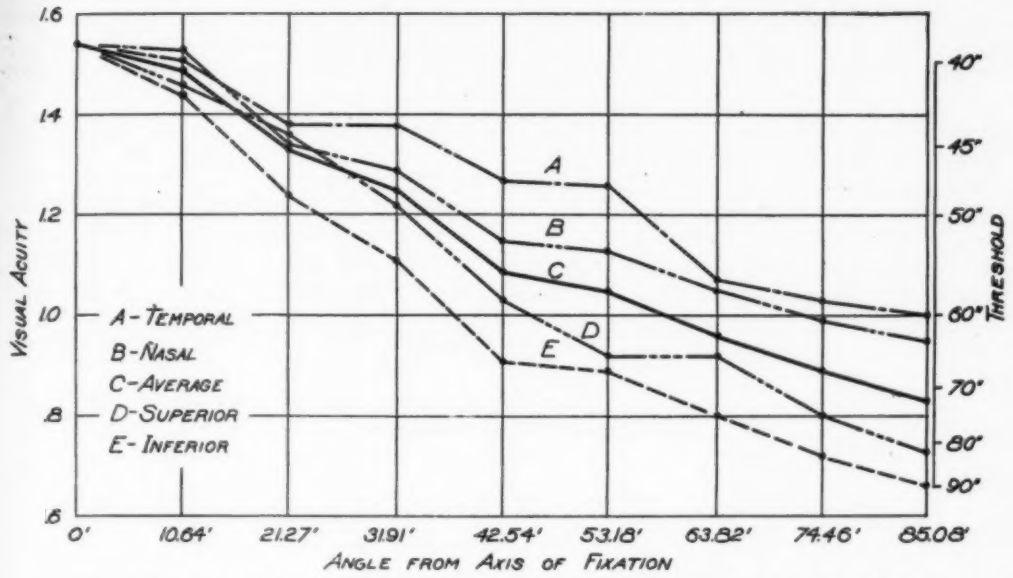

Fig. 4 (Weymouth). The acuity of W. in the four meridians of the visual field.

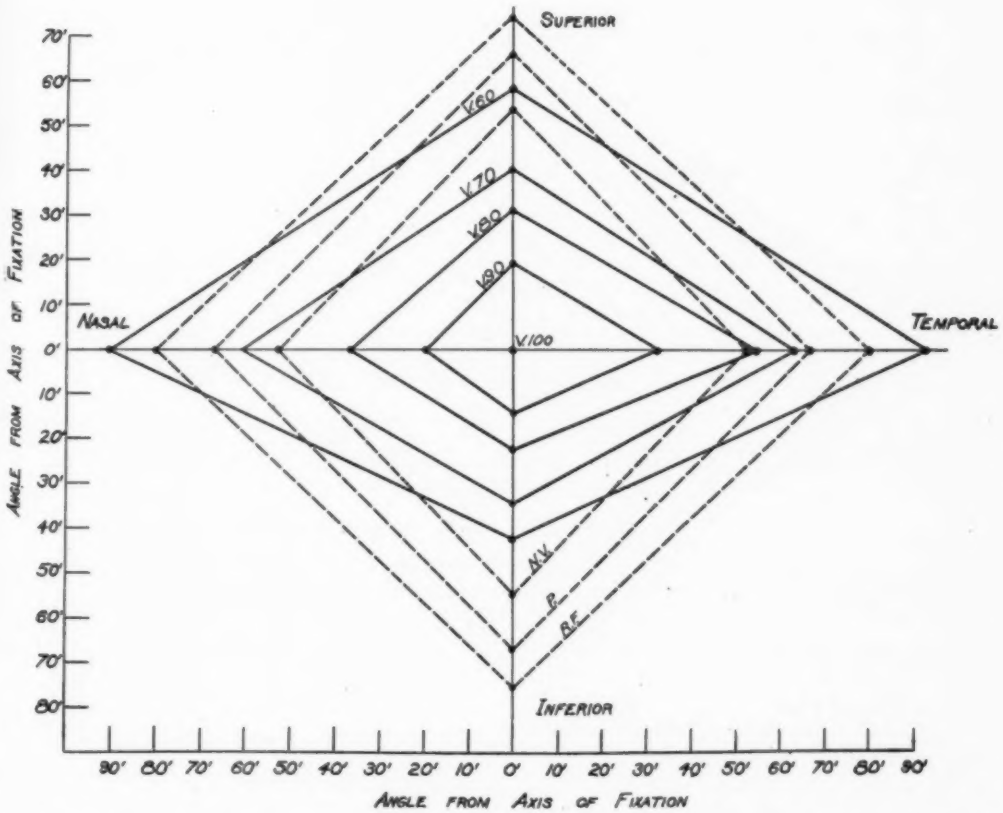

Fig. 5 (Weymouth). Isopteral chart of W. showing points of equal acuity together with the diameters of the nonvascular (N.V.), pigmented (P.), and the rod-free (R.F.) areas.

for W., however, shows differences and probable errors as shown in table 3.

The first one of these is not significant and the second is on the borderline, but the last two are definitely significant, and the whole must be considered so, as in no case is the determination at 10.64′ greater than at fixation. Even though this first excentric determination was not obtained for the other subjects, the trend of the gradient would require a similar difference.

retina, but either the average or the maximum of an area.

Third: The different meridians used show different rates of change of acuity, as given for W. in figure 4; the horizontal showing in general the higher acuity in all three subjects. These results are more clearly represented in the isopteral diagram (figure 5) in which the points of equal acuity on the four chief meridians of the right eye of W. are connected. The observations of Wh. present a similar picture.

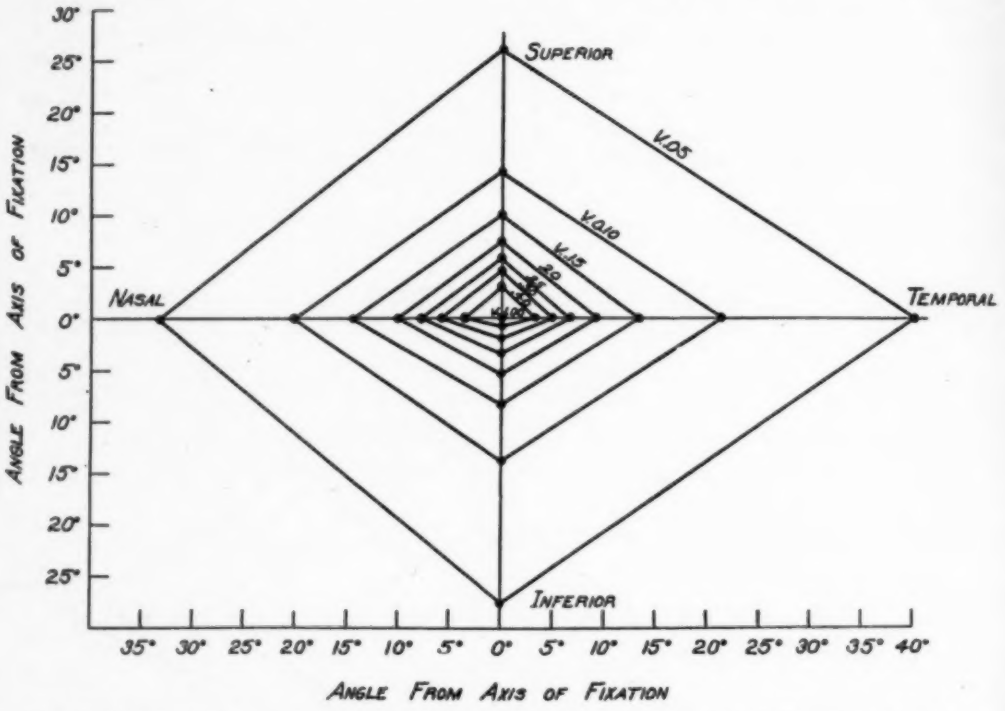

Fig. 6 (Weymouth). Isopteral chart of entire visual field based on Wertheim's data for the four principal meridians; for comparison with figure 4.

That the difference is even greater than that shown is indicated by a consideration of two factors:

a. Gross inaccuracies of fixation would tend to be toward the test object rather than away, as it is the center of interest. This tends not only to decrease the apparent difference in acuity but also to increase the probable error by spreading the distribution of judgments.

b. As discussed above, each determination tests, not a point on the

An isopteral graph constructed from the data of Wertheim[27] is given for comparison (figure 6).

We obtained the following order of descending acuity: temporal, nasal, superior, inferior. Wertheim's order for the periphery (points excentric 20° or more) is: temporal, nasal, inferior, superior. The visual field, which is actually an isopter (but for light sense rather than for acuity), shows the order: temporal, inferior, nasal, superior[12]. The fields for colors are

similar to that for white light. It is to be noted that the inferior meridian, while of least acuity in and near the fovea, shows a relatively lesser rate of fall of acuity than do the other meridians, which remain in the same relation to each other.

An unexpected discovery was that of a relation between the visual acuity and the direction of the lines of the test object with reference to the axis of fixation. In each case the acuity was higher when the lines pointed

A, horizontal meridian tested with horizontal lines.
B, horizontal meridian tested with vertical lines.
C, vertical meridian tested with vertical lines.
D, vertical meridian tested with horizontal lines.

The explanation is not perfectly clear. The right eye of the subject whose values are quoted is not astigmatic by the ordinary tests. The exposure was supposedly short enough to preclude fixative eye movements such

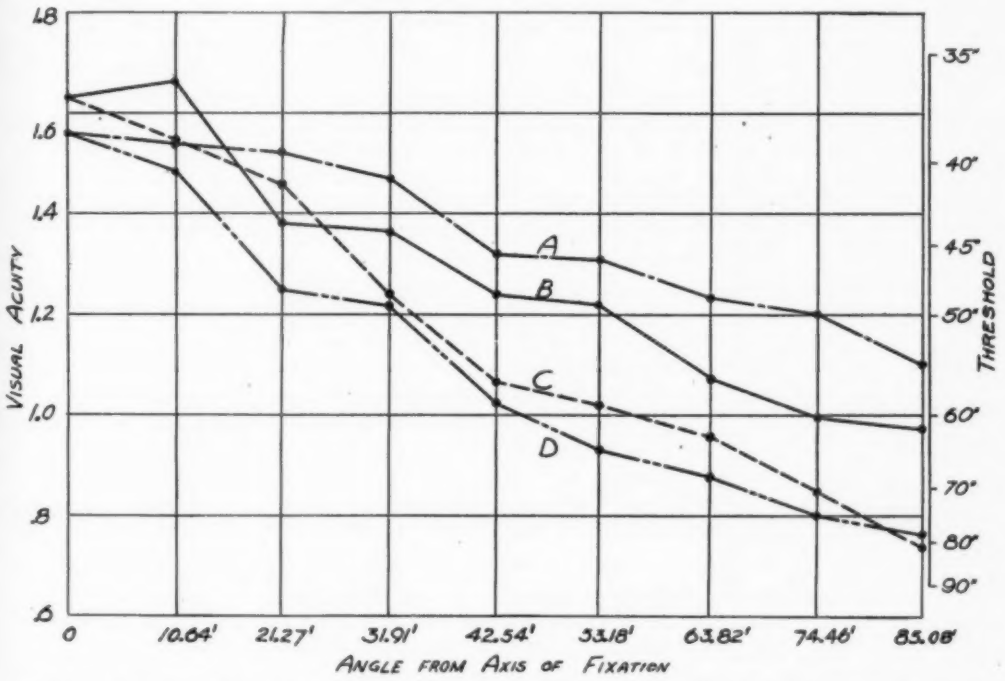

Fig. 7 (Weymouth). Relation between the acuity and the direction of the lines of the test object for W.

toward the axis of fixation than when they were perpendicular to that direction. Thus, it was found that in the vertical meridian the acuity was higher for the vertical direction of the lines than for the horizontal, while in the horizontal meridian the acuity was higher for the horizontal than for the vertical lines, the effect being more marked in the latter case. This is shown graphically in figure 7. It will also be noted that with direct fixation vertical lines are better perceived.

as would tend to blur lines which were not parallel to the direction of movement, but this factor cannot wholly be excluded nor its importance determined. The explanation may lie in a different configuration of retinal elements in the meridional direction, giving an actual higher acuity when the points distinguished have their separation at right angles to the meridian.

Sensory gradient and fixation: The present investigation seems to have its

greatest significance in relation to fixation. Those sense organs presenting an extensive sensory field show differences of sensitivity in different parts of this field. If such topographical differences are regular and uniform, we may speak of a *sensory gradient* or gradient of sensitivity. The eye presents such a sensory gradient in a more marked degree than any other receptor; the present work serves to extend our knowledge of this gradient into the area centralis; and, as we shall show, such a gradient is fundamental for fixation and those eye movements which bring it about.

In considering the basis of fixation, we must remember that it is a response on the part of the ocular muscles to a stimulus received on the retina, the response being effected through the central nervous system. The accuracy of such a reaction is, of course, dependent on the least sensitive element in it, just as the strength of a chain is dependent on its weakest link. And so, if investigation of the relative sensitivity of the various elements shows some more accurate than the complete act of fixation itself, then we may rule them out as the limiting factors in fixation, although all the elements are of course necessary to fixation.

For our purposes, the reaction of fixation may be divided into the two elements, sensory and motor, the first including the excitation of the retinal receptors and the integration of the nervous impulses so caused into a perception in the central nervous system, the second including the activation of the ocular muscles. The accuracy of these two inclusive factors has to some extent been measured; that of their subdivisions has not been analyzed.

As to the accuracy of the act of fixation itself, the most careful determination is that of Marx and Trendelenburg[22]. With graphic methods accurate to 15 or 20″, they observed in maintained fixation oscillating fluctuations of about 1′ on which were superimposed irregular fluctuations of 4 to 5′. These larger movements they interpret as due to corrective movements arising when the image departs more than 2.5′ from the center of a fixation area. When two points a short distance (18′ 17″) apart were alternately fixed, the errors were not greater than the variations in fixation of a single point. The limit of accuracy of fixation as a whole, then, appears to be 2.5′.

The limit of accuracy of the motor part is difficult of determination, since it is almost impossible to separate it from some sensory element. One method of approach to the problem would appear to be that of the threshold for binocular perception of distance (parallax and all distinguishing features of object and surroundings being eliminated), so that the determining factor is the perception of differences in convergence. Fulfilling such requirements are the determinations of Bourdon[5]. Using successive exposures of a stationary object at different distances, he obtained a threshold of about 4′ at 25m. The determinations of Wundt[20], which gave a threshold of 1′ 24″, are open to objection on the grounds of method.

Such a determination, however, involves the perception of changes in the relative position of the two bulbs, a perception which is not necessary to fixation, where the accuracy is checked by exteroceptive sensations from the retina rather than by proprioceptive from the motor apparatus of the bulb. The threshold here cited seems more likely that for the perception than for the motion.

Chiba[8], using the records of Marx and Trendelenburg[22], considers the small oscillations of the eyeball as the smallest muscular movements (=1′). He finds the number in a lateral turn of 40° about equal to the number of fibers in the abducens nerve. While capable of other interpretations, such data are at least highly suggestive, and of course the ultimate limit of control would thus be the coming in or falling out of one nerve fiber. This limit may or may not be 1′ and also may or may not be under voluntary control. In other words, we have no definite de-

termination of the accuracy of the motor element.

As for the keenness of the sensory part of the reaction, Averill and Weymouth[2] find that the threshold for the perception of displacements in segments of a straight line may be as small as 0.04′ (0.02 micron on the retina), an angular distance 1/60 that of the accuracy of fixation. The eye can, then, perceive differences sixty times smaller than it can fix separately; so that fineness of fixation cannot be immediately dependent on fineness of perception.

To be distinguished from fineness of perception (or visual acuity in the broad sense) is change of fineness of perception (or sensory gradient). The two do not necessarily parallel each other, for a high acuity may be uniform, giving a low gradient, or a low acuity may fall off rapidly, giving a high gradient. We have left to consider, then, this sensory gradient.

The idea that variation of acuity, or sensory gradient, is the basis of fixation is not a new one. Javal[19] propounded it as long ago as 1896, and Duane [12] (pages 267, 290, 342) reiterated it in 1924, although realizing the lack of information regarding sensory gradient within the fovea. Marx and Trendelenburg[22] believe their "fixation area" is based on differences of acuity within the area centralis, the image being brought back to the area of maximum acuity as soon as it becomes of appreciably less than the maximum distinctness.

To the view that a sensory gradient is the basis of fixation strong support is lent by the work of Simon[24] on fixation in scotopic or dark adaptation. He finds that with the relative depression of central vision in dark adaptation the most sensitive portion of the retina becomes extracentral, and a new axis of fixation as much as 2° from the one used in bright light may be selected. The direction varies with different subjects, and fixation is less accurate and rapid. Observations of similar new fixation points in strabismus have been recorded, but accurate information is scarce. Simon believes the position of the fixation point in dark adaptation to rest on a balance between falling acuity and rising sensitivity to light as we pass out of the fovea.

While the motor element can not at the present time be entirely eliminated as the possible factor determining the accuracy of fixation, the work of Simon seems to show almost conclusively that the point or axis of fixation is determined by the sensory gradient, the image being made to fall on that part of the retina where it is perceived with greatest distinctness. And it seems entirely logical that if the sensory gradient determines the area on which the image falls when an object is fixed, it must also determine the accuracy with which the image is maintained on that area. In other words, if the sensory gradient determines the axis of fixation it must also determine the accuracy of fixation.

That a significant difference in visual acuity exists within 2.5′ of the axis of fixation is entirely consistent with the present work. While our nearest determination is probably somewhere between 6′ and 11′, as brought out above, the results are significant enough to admit a threshold as close to the axis of fixation as 2.5′.

Further determinations with more refined methods will doubtless establish this threshold and more closely approximate the exact gradient and its peak.

Summary

The present work is an investigation of the visual acuity of a central retinal region (including the fovea) with a radius of 85′ or 0.42 mm. from the axis of fixation. The method of observation gives significant results for three observers as indicated by the probable errors.

1. In the light adapted eye a uniform sensory gradient is shown to exist in this central area similar to that found in the entire retina (cf. Wertheim, Aubert, Fick, and others). The visual acuity attains a sharp maximum at the axis of fixation; it decreases rapidly but regularly in all directions; it shows

no breaks or marked variations in rate of change at the margins of any of the known anatomical areas (fovea, rod-free area, pigmented area or macula, or nonvascular area).

2. A significant difference is shown to exist for two observers between direct fixation and 22′, and for one observer for 11′, showing that the gradient continues to the very center of the retina. A similar retinal gradient is indicated by Wertheim to 2° 30′ and by Aubert to 1° 15′.

3. The horizontal and vertical meridians (the only ones tested) are shown to have different rates of decrease of visual acuity from the axis of fixation.

4. The acuity is shown to be higher when the lines of the test object point toward the axis of fixation.

5. These results strongly support the view that the sensory gradient is the basic factor in eye movements and fixation.

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FREQUENCY OF THE CLAUDE BERNARD-HORNER SYNDROME

Report of sixteen cases

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In sixteen cases encountered over a period of four years, enophthalmos, ptosis, and narrowing of the palpebral fissure were present without exception; and miosis was present in all except one case. Hypotony was present in over a third of the cases, heterochromia in two cases. The etiology of the sympathetic paralysis was determined in only one case, in which it was syringomyelia. Read before the American Ophthalmological Society, May, 1928.

In the past the Claude Bernard-Horner syndrome has been studied more exclusively by neurologists. This fact has given it a distinctly neurological significance, while in other branches of medicine it has been infrequently reported.

Osler, in a few lines, says this condition of enophthalmos, ptosis, and so on is present in diseases of the esophagus. On the other hand Oppenheim in his textbook on nervous diseases, gives a minute description of the etiology and symptoms of a lesion of the cervical sympathetic nerve.

A series of sixteen cases of cervical sympathetic nerve lesions, producing the Claude Bernard-Horner syndrome, implies that this condition is not as rare as the paucity of the literature with regard to it would indicate. A glance at the many underlying etiological factors is proof to this effect.

The causes usually ascribed are cervical ribs, enlarged cervical glands, aneurism, mediastinal tumor, tumor of the cervical cord, involvement of the apices of the lung, and injuries to the brachial plexus roots. Pancoast reported three cases of diffuse infiltrating endothelioma of the pleura and one of primary carcinoma of the upper lobe of the lung, as causing oculopupillary symptoms. During the war, trauma to the cervical sympathetic from gunshot wounds of the neck was frequently seen.

There is as yet little knowledge of the pathways of the sympathetic fibers in the brain. Doubtless, however, a certain relationship exists between the cortex and the cervical sympathetic fibers controlling oculopupillary symptoms, because certain emotions such as fear and pain produce changes in the size of the pupil.

On the other hand, Karplus and Kreidl, experimenting on animals, decided there were probably sympathetic fibers for the eye existing in the cerebral peduncle, and that such fibers mostly supplied the heterolateral eye. They concluded there was a subthalmic center; and that irritation of the base was transmitted through the homolateral cerebral peduncle, crossed in part lower down to descend in the cervical cord, mostly on the heterolateral side, and then went through the cervical sympathetic to the eye.

Spiller also thinks sympathetic fibers exist in the cerebrum and probably decussate in the peduncle, but that they do not do so lower down in the pons or medulla. Lafon says inequality of the pupils may be caused by reflexes from the abdomen or chest acting on the centripetal sympathetic, which in its passage through the bulb acts on the sympathetic pupillomotor fibers or on the nucleus of origin of the same side.

The ciliospinal center of Budge, located in the lateral horn of the cord at the level of the eighth cervical and first thoracic segments, sends preganglionic fibers by way of the anterior roots of the eighth cervical and first and second thoracic nerves to the cervical sympathetic ganglia. The closely associated vasomotor and sudomotor centers are placed at different levels by different authors. Some locate the former in the posterior horn at the same level as the ciliospinal center. Others place it lower down at

the second to fourth thoracic segments, while the sudomotor center is placed at the fourth to sixth thoracic segments.

However, it is not the purpose of this paper to determine the exact location of these centers and fibers, but to present the cases here studied and to analyze the data extracted therefrom.

I will briefly discuss the three most interesting cases, and will summarize the rest.

Case 1: Mrs. R., aged twenty-nine years, came for consultation because of severe headaches and twitching of the right eyelids. At the age of sixteen years, her left eye had been operated upon for congenital cataract. Her vision in the right eye was 6/6 and in the left eye counting figures at one meter. She presented enophthalmos, ptosis, narrowing of the palpebral fissure, and miosis on the right side. There was also hypotonus, the right eye measuring 18 mm. and the left 22 mm. of mercury, beside right-sided hemiatrophy of the face, unilateral flushing, and heterochromia iridis. The right iris was blue, while the left one was brown, a condition which had existed since infancy. Tournay's sign was present. X-ray and physical examinations were negative.

Case 2: Mrs. A., aged twenty-nine years, came to the clinic of the Pennsylvania Hospital complaining of headaches. She said there had been a difference in the size of her two eyes as long as she could remember, otherwise past history was negative. Vision was O.D. 6/9, O.S. 6/12; near point O.D. 17 cm., O.S. 22 cm. There was right-sided enophthalmos, ptosis, narrowing of the palpebral fissure, and miosis. The right iris was bluish brown, the left iris dark brown. Right palpebral fissure 6 mm., left palpebral fissure 9 mm.; right pupil 3 mm., left pupil 5 mm.; under cocaine, right pupil 4 mm., left 7 mm. Intraocular tension O.D. 14 mm., O.S. 18 mm. Right hemiatrophy of the face and Tournay's sign.

The patient had large infected tonsils. X-ray, physical, and neurological examinations were entirely negative. No evidence of cervical rib, tumor, or aneurism could be elicited.

Case 3: Mr. L. aged eighteen years, was examined June 26, 1923, for glasses. His past history was as follows: He had been born after prolonged and difficult labor, with high forceps delivery. He was able to walk

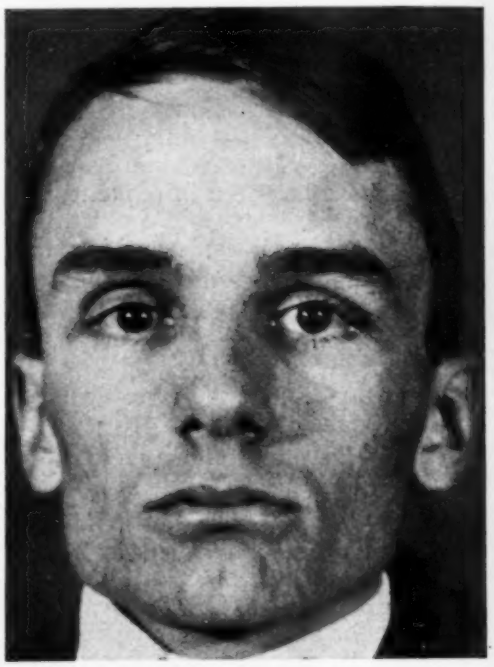

Fig. 1 (Scarlett). Showing enophthalmos, narrowing of the palpebral fissure, ptosis of the right upper lid, and hemiatrophy of the right side of the face. (This case also presented unilateral sweating.) Diagnosis, syringomyelia.

at one year. Shortly after learning to walk he developed what was termed scurvy, during which illness he lost his ability to walk, and he did not regain this faculty for several months. In 1912 he first developed slight right scoliosis. Exercises were prescribed and improvement was noted for a time. By 1915 the scoliosis was marked, and it has increased to date.

Neurological examination made in September, 1923, revealed a paralysis of the right cervical sympathetic nerve with accompanying hemiatrophy of the face on the affected side, and the

Klumpke type of paralysis of the inner side of the forearm and of the small muscles of the hand, with dissociation of sensation over the latter areas and over the right upper portion of the trunk.

There was scoliosis of the most extreme type. The scapula and right thorax protruded greatly backward.

A diagnosis of syringomyelia was made.

This patient's vision in 1923 was 6/7 in each eye, while in December, 1927, it had been reduced in the right eye to 6/15, and had remained 6/7 in the left. Both were corrected to 6/5. Enophthalmos, ptosis, narrowing of the palpebral fissure, and miosis were present on the right side. Near point was O.D. 10 cm., O.S. 13.5 cm. Right palpebral fissure was 9 mm., left 11 mm. Right pupil was 3 mm., left 5 mm. Under cocaine, right pupil was 4 mm., left 7 mm. Intraocular tension of O.D. was 14 while that of O.S. was 18 mm.

Fig. 2 (Scarlett). Right eye of patient no. 16 in the table, showing enophthalmos, pseudoptosis, and miosis.

There was sweating of the right side of the face on mastication, and unilateral flushing. Tournay's sign was present.

Incidentally, although it has no scientific bearing, it is an interesting fact that this young man, despite all handicaps, is going through Princeton University.

Comment

Sixteen cases were encountered over a period of four years, and the following data were observed: The chief oculopupillary symptoms, namely enophthalmos, ptosis, and narrowing of the palpebral fissure, were present in every patient, while miosis was absent once, which might have been due to the fact that fibers for the dilatator muscle of the iris leave the ciliospinal center by more than one pathway and are thus not always completely involved.

Spiller saw a case with tumor of the cord in which it was necessary to cut the first dorsal root. Miosis resulted, but the pupil still reacted to light and accommodation, showing that the pupillary fibers were not all contained in the first dorsal root.

Hypotony was seen in more than one-third of the cases. The tension of the hypotonic eye averaged 3.5 mm. less than that of the fellow eye. This condition, according to de Schweinitz, might have been due to vascular changes or possibly to muscular changes.

The near point averaged three centimeters less in the affected eye in all patients in which it was measured, while the vision was slightly below that of the fellow eye in all but four instances.

Heterochromia iridis was present but twice, having been noted in both instances as long as the patients or members of their families could remember. This information is in accord with that furnished by others who have studied heterochromia iridis, in that it has its incipiency only in the very young and, according to Angelucci, is due to trophic changes resulting from the altered effect of the paralyzed cervical sympathetic nerve on the blood vessels of the iris. Calhoun believes this condition results from the fact that in infants the pigment cells are young and easily absorbed. Jackson thinks that, if the sympathetic takes part in causing heterochromia iridis, the ciliary ganglion is probably the important seat of the lesion.

Of the associated signs, hemiatrophy

	MISS H. #1 22 YRS.	MRS. A. A. #2 29 YRS.	MR. L. #3 19 YRS.	MASTER G.R. #4 9 YRS.	MISS A. #5 20 YRS.	MR. J. #6 55 YRS.	MRS. K. #7 58 YRS.	MR. S. #8 34 YRS.	C. N. #9 9 YRS.	MISS H. #10 10 YRS.	MRS. E.H. #11 42 YRS.	MISS J.S. #12 9 YRS.	MRS. F #13 35 YRS.	MR. A.S. #14 24 YRS.	MRS. W. MOTHER #15 30 YRS.	M. W. SON #16 9 YRS.	
ENOPHTHAL	+ O. D.	+ O. D.	+ O. D.	+ O. S.	+ O. D.	+ O. D.	+ O. D.	+ O. D.	+ O. D.	+ O. S.	+ O. S.	+ O. S.	+ O. S.	+ O. S.	+ O. S.	+ O. D.	10 +
PTOSIS	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	10 +
NARROW P. F.	+ O.D. 9 MM. O.S. 12 MM.	+ O.D. 8 MM. O.S. 9 MM.	+ O.D. 9 MM. O.S. 11 MM.	+ O.D. 8 MM. O.S. 9 MM.	+ O.D. 9 MM. O.S. 11 MM.	+ O.D. 8 MM. O.S. 10 MM.	+ O.D. 8 MM. O.S. 11 MM.	+ O.D. 9 MM. O.S. 9 MM.	+ O.D. 9 MM. O.S. 10 MM.	+ O.D. 11 MM. O.S. 9 MM.	+ O.D. 10 MM. O.S. 7 MM.	+ O.D. 10 MM. O.S. 8 MM.	+ O.D. 10 MM. O.S. 9 MM.	+ O.D. 11 MM. O.S. 8 MM.	+ O.D. 12 MM. O.S. 9 MM.	+ O.D. 9 MM. O.S. 11 MM.	10 +
MIOSIS	+ O.D. 3 MM. O.S. 5 MM. CQC. O.D. 4 MM. O.S. 7 MM.	+ O.D. 3 MM. O.S. 5 MM. CQC. O.D. 4 MM. O.S. 7 MM.	+ O.D. 3 MM. O.S. 5 MM. CQC. O.D. 4 MM. O.S. 7 MM.	+ O.D. 3 MM. O.S. 5 MM. CQC. O.D. 4 MM. O.S. 7 MM.	+ O.D. 3 MM. O.S. 5 MM. CQC. O.D. 5 MM. O.S. 8 MM.	+ O.D. 4 MM. O.S. 8 MM. CQC. O.D. 7 MM. O.S. 9 MM.	+ O.D. 1½ MM. O.S. 3 MM. CQC. O.D. 2 MM. O.S. 7 MM.	+ O.D. 2 MM. O.S. 5 MM. CQC. O.D. 7 MM. O.S. 8 MM.	+ O.D. 3 MM. O.S. 6 MM. CQC. O.D. 5 MM. O.S. 8 MM.	+ O.D. 5 MM. O.S. 2 MM. CQC. O.D. 6 MM. O.S. 3 MM.	+ O.D. 5 MM. O.S. 4 MM. CQC. O.D. 7 MM. O.S. 4 MM.	+ O.D. 5 MM. O.S. 3 MM. CQC. O.D. 6 MM. O.S. 4 MM.	+ O.D. 4 MM. O.S. 4 MM. CQC. O.D. 6 MM. O.S. 4 MM.	+ O.D. 5 MM. O.S. 4 MM. CQC. O.D. 6 MM. O.S. 4 MM.	+ O.D. 6 MM. O.S. 6 MM. CQC. O.D. 9 MM. O.S. 6 MM.	EQUAL CQC. O.D. 4 MM. O.S. 6 MM.	10 +
HYPO-TONUS	+ O.D. 18 O.S. 22	+ O.D. 14 O.S. 16	+ O.D. 14 O.S. 16	—	+	+ O.D. 16 O.S. 16	—	—	—	+ O.D. 18 O.S. 16	+ O.D. 20 O.S. 16	—	—	—	+	—	8 + 8 -
HETEROCHR. IRIDES	+ O.D. BLUE O.S. GRAYISH-BROWN	+ O.D. BLUISH-BROWN O.S. DARK BROWN	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2 + 14 -
HEMIAT. FACE	+ RIGHT SIDE SLIGHT	+ RIGHT SIDE	+ RIGHT SIDE	+ RIGHT SIDE SLIGHT	+ RIGHT SIDE	+ RIGHT SIDE	+ RIGHT SIDE	—	+ RIGHT SIDE	+ LEFT SIDE	—	—	+ LEFT SIDE SLIGHT	—	+ LEFT SIDE	+ RIGHT SIDE	12 + 4 -
UNILATERAL FLUSHING	+	—	+	+	—	—	—	—	—	+	—	—	—	—	—	+	5 + 11 -
ANHIDROSIS	—	—	+	+	—	—	+	—	—	+	—	—	—	—	—	—	4 + 12 -
TOURNAY'S SIGN	+	+	+	+	—	—	+	+	+	+	+	+	+	+	+	+	14 + 2 -
N. P.	O.D. 14 CM. O.S.	+ O.D. 17 CM. O.S. 22 CM.	O.D. 10 CM. O.S. 10 CM.	O.D. 8 CM. O.S. 8 CM.	O.D. 16 CM. O.S. 16 CM.	O.D. 25 CM. O.S. 30 CM.	O.D. 20 CM. O.S. 23½ CM.	O.D. 16 CM. O.S. 19 CM.	O.D. 7 CM. O.S. 10 CM.	O.D. 13 CM. O.S. 10 CM.	?	—	?	?	?	?	AVERAGE 3 CM.
KLUMPKE PARAL. ASSOC.	—	—	+ RIGHT SIDE	—	—	—	—	—	—	—	—	—	—	—	—	—	1 + 15 -
VISION	O.D. 20/30-CC 20/15 O.S. C.F. 1 METER	O.D. 6/6 O.S. 6/12	O.D. 6/6 CC 6/4 O.S. 6/6-CC 6/4	O.D. 6/6 CC 6/6 O.S. 6/6 CC 6/6	O.D. 20/15 CC 20/15 O.S. 6/6 CC 6/6	O.D. 6/6 CC 6/6 O.S. 6/20 CC 6/6	O.D. 6/30 CC 6/6 O.S. 6/20 CC 6/6	O.D. 6/6 - O.S. 6/6 -	O.D. 6/30 O.S. 6/60	O.D. 6/6 CC 6/6 O.S. 6/15 CC 6/6	O.D. 6/30 CC 6/9 O.S. 6/6 CC 6/6	O.D. 6/6 O.S. 6/30 CC 6/9	O.D. 6/6 O.S. 6/6	O.D. 6/30 O.S. 6/7	O.D. 6/6 O.S. 6/7	O.D. 6/6 O.S. 6/7	O.D. 6/60 EXT. STROB. O.S. 6/7	—
FUNDUS	—	—	—	—	—	—	—	—	—	—	SCLEROSIS OF RETINAL VESSELS	—	O.D. HEM. ANEURISM. ATOXIS	—	—	—	—
ETIOLOGY	—	—	+ SYRING.	—	—	—	—	—	—	—	—	—	—	—	—	—	—

of the face was seen nine times, unilateral flushing five times, anhydrosis three times, and the Klumpke type of paralysis once.

According to Angelucci, after paralysis of the cervical sympathetic, there is first a dilatation of the vessels, followed by a hyaline degeneration of the walls and then a contracture of the lumen, with subsequent lack of nutrition when atrophy results. This is supposed by him to be the cause of hemiatrophy of the face in a majority of the cases. Heiligenthal thinks it is due to atrophy of the fatty tissue.

The third case was interesting in that it was the only one of the series in which we were able to determine the etiology of the sympathetic paralysis. The cause of the condition was diagnosed as syringomyelia by Professor Spiller. In a personal conversation with him, he said syringomyelia was frequently seen as the underlying factor in cervical sympathetic paralysis. This case was also the only one which was associated with paralysis of the inner side of the forearm and of the small muscles of the hand, the Klumpke type of paralysis.

The presence of a mother and son in the series suggests the possibility of heredity as an etiological factor of the oculopupillary syndrome. This has been mentioned by Calhoun in his monograph on heterochromia iridis.

Conclusions

1. Paralysis of the sympathetic in full or in part is more frequent than the literature indicates.

2. The cause of such paralysis was possible of determination in only one case of this series.

3. The difference between the near points of the two eyes of these patients was greater in those showing the most complete syndrome.

4. The average difference between the pupils, before the instillation of cocaine, was 1.8 mm., while afterward it was 3 mm., the smallest discrepancy being 2 mm., and the largest 5 mm.

5. The width of the palpebral fissure averaged 3.5 mm. less on the affected side.

6. There were no fundus changes visible.

230 South Twenty-first street.

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APPLICATION OF THE BAR-READER TO CAMPIMETRY, STEREOCAMPIMETRY, AND OTHER PURPOSES

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The diagnostic and other applications of the bar-reader suggested by the writer include: (1) rapid campimetry with binocular fixation; (2) the detection of simulation; (3) fusion and stereopsis tests and training; and (4) examination of near points of accommodation and convergence, and deviations for near point.

In addition to the familiar use of the bar-reader in the diagnosis and therapy of concomitant strabismus, there are some applications of the device which to my knowledge have not been hitherto described. Often casually referred to as a pencil held between eyes and page, without defining width and position, and sometimes inaccurately described as a means of testing and provoking single binocular vision, the bar and the principle of its application have not received the attention they deserve even in our more elaborate textbooks on ophthalmology.

For the applications proposed the bar should be treated as a greater instrument of precision than the crude pencil can be, and its modus operandi stated more clearly than is the case in textbooks and monographs dealing with the ocular muscles.

The transverse bar placed vertically between the eyes and a page of print not merely hides from one eye a part that is seen by the other eye and vice-versa, as is usually stated, but is itself an object of perception. It is also seen doubly. The diplopia is not perceived when the bar is held too closely to the page or, to be more precise, when no binocular field of fixation is left interposed between the two monocular fields cut out by the bar, by reason of the touching or overlapping of the two images of the bar. It becomes at once apparent on bringing the bar closer to the eyes to permit an intervening median field of binocular fixation. The retinal images of the bar are seen, of course, in physiological crossed diplopia, and are projected enlarged to the page or whatever other plane of fixation is used. The enlargement is in inverse proportion to the distance of the bar from the eyes, and is twofold with the bar placed midway between the eyes and the plane of fixation.

In its zone of action, that is, in the areas covered by the projected images of the bar, fixation and vision are monocular, with homolateral exclusion for the amblyopic eye, whether from squinting or other causes, and with binocular exclusion where the two areas overlap. Simultaneous macular perception in this zone is as a corollary excluded, and simultaneous vision, monocular or binocular, is permitted only in the sense in which vision is simultaneous in field taking or diplopia, that is, it permits in its zone of action simultaneously with the macular vision of an eye peripheral vision of that eye or of the fellow eye as well. This analysis would seem superfluous were it not for the fact that the terms are so often loosely and carelessly applied. The best definition of the mode of action of the bar is that of Maddox, who describes it as a test of the power of rapid alternate binocular vision.

While the bar can be used alone, in a variety of ways to be described, in functional tests involving binocular fixation and vision, it occurred to me that a further group of tests could be made available by placing a test-object on the bar and utilizing its crossed physiological doubling and projection on the plane of fixation. This test-object may take the form of the usual test-object employed in campimetry. However, as an experiment that presents no practical advantage over the use of the stereoscope, I may add that I personally have no difficulty in obtaining fusion and stereopsis in com-

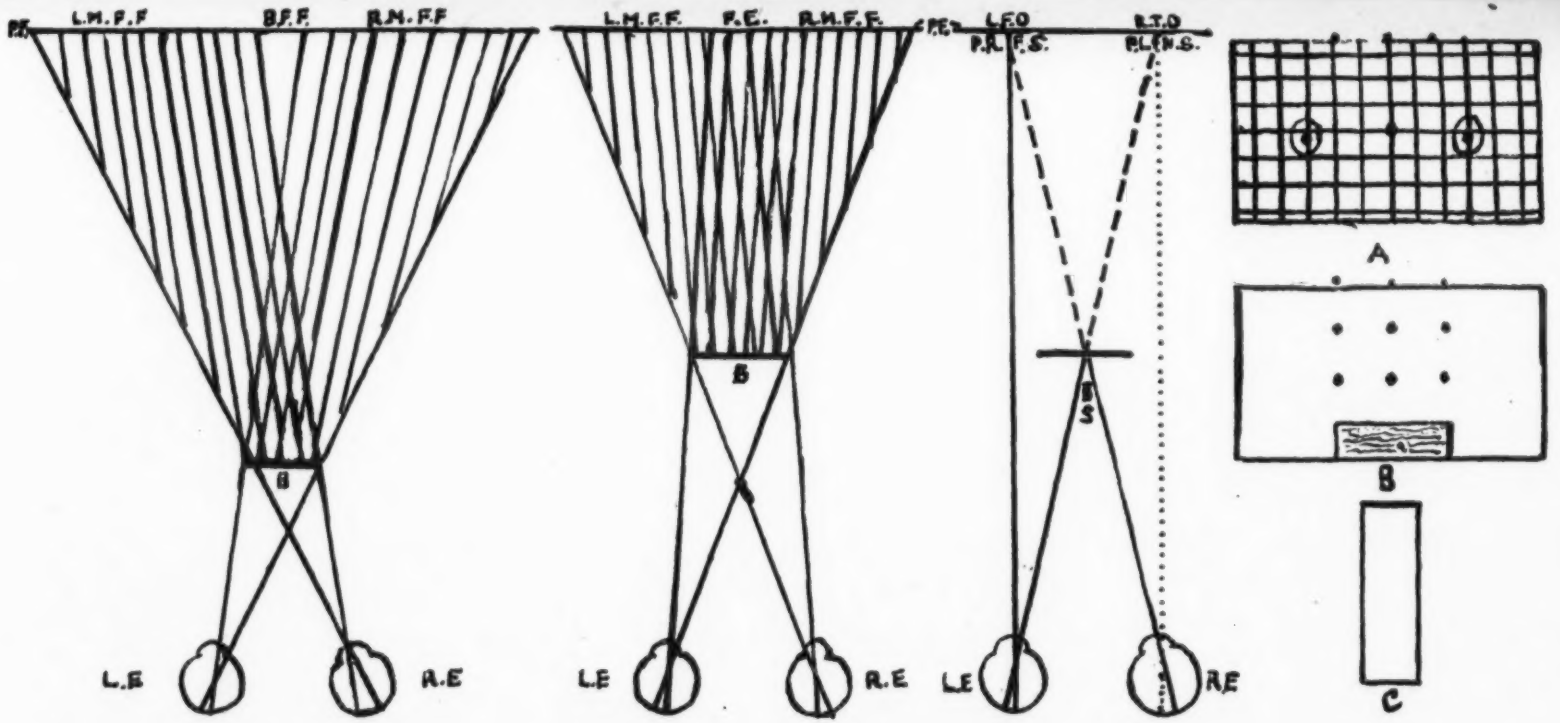

Fig. 1 Fig. 2 Fig. 3 Fig. 4

CAMPIMETRY, STEREOCAMPIMETRY, AND OTHER APPLICATIONS OF BAR READER (DAVIDSON).

Fig. 1. Position of bar (B) and plane of fixation (P. F.) or card which allows an intervening zone of binocular field of fixation (B. F. F.) between the left (L. M. F. F.) and right (R. M. F. F.) monocular field of fixation. The bar is drawn narrower and placed further from eyes in diagram to reduce horizontal dimensions of drawing.

Fig. 2. Position of bar (B) and plane of fixation (P. F.) or card, giving zone where fixation is excluded (F. E.) between left (L. M. F. F.) and right (R. M. F. F.) monocular field of fixation.

Fig. 3. To illustrate superposition of projected right foveal stimulus (P. R. F. S.) placed on bar (B. S.) on left fixation object (L. F. O.), and of projected left nasal stimulus (P. L. N. S.) on object perceived temporally by right eye (R. T. O.). To simplify drawing, lines outlining action of bar, as in fig. 2, and corresponding fixation of right eye omitted.

Fig. 4. Diagram of card and bar as described in text. A, blind spot side. B, scotometry and reader side. C, bar.

bination with the charts by attaching to the bar one of the halves of the figures of the standard stereoscopic charts, reduced to the size appropriate to the enlargement incidental to the experiment. This test-object used on the bar, to distinguish it from the fixation test-objects on the plane of fixation, will be referred to hereafter as the stimulus. This stimulus, projected to the plane of fixation, is, like the bar itself, not only enlarged, but because it is out of focus is somewhat blurred, and is also less bright in its center than in its periphery. For all practical purposes this disadvantage can be sufficiently obviated by reducing as much as possible the focal differences between the bar and the plane of fixation, that is by reducing the distance between them, or by placing them both further from the eye. For studies requiring greater accuracy, for experimental work for instance, the blurring may be entirely eliminated by arming the non-fixing eye with a convex lens of appropriate strength. Some patients may not become aware at once of the diplopia of the stimulus or will persist in glancing at the latter. These and similar difficulties, however, are encountered in field taking by any method, and require patience on the part of the examiner, as well as cooperation and intelligence on the part of the examinee. Heterophoria of low degree does not interfere with this application of the bar. Higher degrees require correction by an appropriate prism.

The accompanying diagrams serve to illustrate and fix in mind the behavior of the crossed double images of the bar and stimulus projected to the plane of fixation in their different relative positions, and the action of a stimulus placed on the bar. The position of figure 1 is used when a zone of binocular fixation is essential, as for instance in blind spot work. The position of figure 2 is indicated when a stimulus is used and its distinctness of perception is essential, as for instance in scotometry.

After trying out bars of different width and color, stationary and movable stimuli, and various arrangements of test-objects of different size, color and distance on the test card, I have found the following simple arrangement to answer all practical purposes (see figure 4): It can be improvised by any one in about fifteen minutes. As a test card I use a dead black piece of cardboard, 14 by 24 cm. One side is ruled with pencil in squares for campimetry at 25 cm. and provides therefore for 25 degrees horizontal and 15 degrees vertical field each way. It has attached three white round fixation objects, one cm. in diameter, one at the center of the card, and the other two in the centers of the two pencil-outlined normal blind spots. On the reverse side of the card there is attached below a strip of Jaeger reader, Nos. 1 and 2, three cm. in height; three cm. above that a row of three round red fixation objects, one cm. in diameter, at three cm. distance from each other, and three cm. above the latter a similar row of green discs. In the upper edge of the card and in line with the discs are stuck three small round-headed pins, a black one in the center and two white ones on either side. For a bar I use a dead-black piece of cardboard, 4 by 14 cm. A Prince's rule provided with two cross slides serves as holder for card and bar. Held horizontally by the patient against his chin, the rule permits steady maintaining of the relative distances of card and bar, as well as shifting at the examiner's will. Symmetry of card, bar, and eyes should, of course, be preserved. Elevation and depression of the distal end of the rule brings the fixation object to the horizontal plane of the eyes, and slight variations in the positions of card and bar are necessary to meet extreme variations from the normal pupillary distance. To the readings of the rule 2.5 cm. should also be added to allow for the position of the chin in front of the center of rotation of the eyes.

The bar with the suggested card may be used for the following purposes:

1. **Rapid campimetry with binocular fixation:** A. For the examination of the blind spots, the campimetry side of the card is as a preliminary placed at thirty cm. with the bar at five cm., that is, as in Fig. 1, and patient is asked to fixate the central disc and to note that he sees the lateral discs as well. The card is then approached to a distance of twenty-five cm., under continued fixation of the central disc, when the lateral discs will have disappeared. The patient is thus prepared for the existence of his blind spots and for their examination. With the usual campimetry test-object on card, the cardinal points of the outlines of the blind spots are determined one after another in a few seconds. Any abnormalities noted are of course examined with greater detail on the larger campimeter. Asymmetrically situated blind spots found in anisometropia and other conditions necessitate different distances of the card for the two eyes.

B. For the detection and outlining of central and paracentral scotomata the colored discs are used as in Fig. 2, with the card at about forty cm. and the bar at about twenty cm. for a radius of five degrees, and at half these distances for a radius of ten degrees from the fovea. Good illumination is particularly necessary for the latter distances. Mere rapid glancing from one lateral disc to the other is in itself sufficient to disclose the presence of a relative scotoma in one eye. For absolute scotomata the patient fixates the disc corresponding to his sound or better eye and the scotoma is outlined by moving a stimulus on the bar in the cardinal directions, white being used with either color and a complementary color for colors in order to take advantage of retinal rivalry.

Simultaneously the presence or absence of homonymous hemianopsia and hemiachromatopsia have been established, for, as shown in Fig. 3, while fixating one lateral object the other lateral object and its superimposed stimulus fall on homonymous halves of the two retinas. Successive fixation of the two objects eliminates or establishes bitemporal and binasal cases. Without the bar, it may be mentioned in passing, the rows of colored discs also serve for the monocular determination of central scotoma for red and green, even in the presence of congenital achromatopsia, by the method of Holth. Held at twenty-five cm. and the central discs fixated, the difference in color between them and the lateral ones is immediately perceived in the presence of a central scotoma.

2. **Detection of simulation:** A. Detection of simulation of monocular blindness may be accomplished by the method of A. Szily, senior (Klinische Monatsblätter für Augenheilkunde, 1920, vol. 65). The following is a brief description of this method, for the benefit of the reader not familiar with it:

The examinee is asked to fixate the central white object of the campimetry side of the card, with card at thirty cm. and bar as in Fig. 1. In monocular blindness, whether real or simulated, the disc corresponding to the blind eye will of course not be seen. While the examinee continues fixation the card is brought to twenty-five cm., when the lateral disc corresponding to the seeing eye disappears from view. The bar is then quickly dropped while the examinee is instructed to continue fixation of the central disc. The really blind person will recover the view of the disc facing his blind eye which he sees of course indirectly with his sound eye. The simulant, on the contrary, associating each lateral disc with its homonymous eye, and having to choose, will favor the side corresponding to his sound eye. This lateral disc of course he must see with his alleged blind eye. As pointed out by Szily, this method is not adapted for the detection of simulation of monocular central scotoma.

B. For the detection of simulated monocular central blindness the crossed double images of a stimulus placed on the bar may be utilized. The simulant, unaware of the crossing of

the images, is again likely to see the stimulus of the same side as the object of fixation, and to see neither the object nor the stimulus of the side corresponding to his alleged blind eye. Only hemianopsia would produce such a result, however, as pointed out above. The examinee may, if very intelligent, discover the trick only by accidentally or intentionally closing one eye during the examination. This must be guarded against in this test as well as in the Szily test.

3. Fusion and stereopsis tests and training: A. Objective determination of stereopsis by a modification of the method of Perlia. The latter consists in making the examinee join end to end a rod held vertically in his hand with another upright rod mounted on a rule held against his chin and hidden from his eyes by a screen. While effectively eliminating monocular judgment of distance by mathematical perspective, it does not provide for checks against accidental monocular successes or binocular failures. By using three upright rods in the same plane, or round-headed pins as I have it, and with the bar instead of, as in the original test, a screen below the level of the eyes, so that the black central one is seen binocularly and the lateral white ones monocularly, I believe the test is made more sensitive. The examinee is asked to touch with a rod held vertically in his raised hand the two lateral heads and then the central one. The difference between monocular and binocular fixation is so striking as to leave no doubt as to the presence or absence of stereopsis. Should the examinee by chance succeed with the first lateral one, a slight shifting of the card forward or backward will counteract his taking advantage of his muscle sense in trying the next one.

B. The main purpose of the three pins, however, is the excellent means they provide for training in rapid alternate fixation and vision in the orthoptic treatment of manifest strabismus with suppression, where the bar fulfils its classical rôle most effectively.

4. Determination of near points of accommodation and convergence and deviations for near points: The bar obviates the cumbersome measuring of the near points of accommodation of the two eyes by successive monocular occlusion and offers a more rapid and accurate method of establishing and correcting inequality of accommodation. The need for correcting it is well recognized in cases of anisometropia, periodic monocular suppression from latent strabismus, unequal rigidity of the lenses, and unilateral weakness of the ciliary muscle. The reading card is incorporated for this purpose and even small differences are readily detected. The bar is placed close to the eyes in this test. The central pin serves admirably for the measuring of the PcB*, without the bar of course.

The deviation for near is noted in the course of testing the near points of accommodation. It is so conspicuous to the patient that in the case of a vertical phoria he will often himself call the examiner's attention to the fact that the lines on the two sides of the reading card are not on the same level; while in the horizontal phoria the patient will call attention to the doubling or overriding of words.

While the arrangement of the card is satisfactory to me, improvements will undoubtedly suggest themselves in working with it. Celluloid would be a more convenient material, and neutral gray may be preferred by others. Separate cards may also be used for the different purposes, instead of the single one I suggest. Two additional rows of colored discs, blue and yellow, which I purposely omitted for lack of space, might then be used. A little Maddox scale could be attached for the measurement of the phorias disclosed, but it would crowd my card too much, and the measurement can be accomplished equally well with a prism. I recommend that the examiner familiarize himself with the principle by experimenting on his own eyes.

210 West Seventieth street

* The distance of the convergence near point from the base line, i.e., the line connecting the centers of rotation of the two eyes.

ORBITAL TERATOMA REMOVED THROUGH KRÖNLEIN INCISION

With a discussion of diagnosis of orbital tumors

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Through a Krönlein incision, a firm tumor mass measuring 23 by 22 by 20 millimeters was removed from the upper outer part of the orbit. For six years the development of a swelling in the upper outer part of the orbit had been accompanied by gradually increasing exophthalmos, and recently the exposure of the eyeball had caused a large sloughing ulcer of the lower two-thirds of the cornea. Vision before operation was counting fingers at eighteen inches, while after operation, with normal position and normal motility, vision of 15/200 was recovered. The tumor contained muscles and connective tissue, cartilaginous metaplasia, and glandular structures. Report and patient presented before the Ophthalmological Section of the New York Academy of Medicine.

The possibilities of new growths in the orbit are many because of its formation and the great varieties of tissues present.

The bony walls, lined with periosteum pierced by no less than nine openings, the lacrymal glands, the ocular muscles, the orbital fat, the cellular tissues, the arteries, veins, nerves, and lymphatics, and the eyeball itself are all capable of giving rise to some form of new growth and subject to inflammatory processes.

We may have, furthermore, metastasis from growths elsewhere as well as extensions from adjacent cavities.

The general symptoms of orbital tumor include:

(1) exophthalmos that comes on rapidly, with pain, redness, and swelling of the lids and conjunctiva; is usually inflammatory, whereas exophthalmos that comes slowly is usually due to tumors
(2) impaired function and motility; the latter often being diminished in the direction of the location of the growth
(3) reduced acuity of vision, depending upon the size and position of the tumor, and more affected by the posterior growths
(4) a visible or palpable mass
(5) circulatory changes in and about the orbit
(6) bruit or other abnormal sounds

Exophthalmos may be classified into (a) vertical, with either upward or downward displacement; (b) horizontal, with inward or outward displacement; (c) diagonal, including four different types, upward and inward, upward and outward, downward and inward, downward and outward; and (d) directly forward.

Directly forward displacement of the eye, with slight upward and outward deviation, is an indication of a new growth of or about the optic nerve.

Downward displacement would indicate the presence of a new growth at the vault or in adjacent tissues, and upward displacement a growth in the lower portion of the orbit.

Oblique displacement downward and inward would suggest a new growth or involvement of the lacrymal gland, while displacement downward and outward would suggest involvement of the frontal sinus, and outward displacement would suggest an infection of the ethmoids.

Other means to be employed in our diagnosis of affections of the orbit are a complete history of the case; size, form, consistency, and motility of the mass; palpation under ether if the tumor is deep; percussion; auscultation; transillumination; focal lighting; fluoroscopy and skiagraphy; the use of the aspirating needle; exploratory incision and removal of tissue for microscopic study; all of the laboratory tests of the blood for general blood dyscrasias such as leukemia, pseudoleukemia, and chloroma; the blood and spinal Wassermann tests; the tuberculin tests; and, finally, the therapeutic tests in the most obscure cases.

It is often very difficult to make a diagnosis between primary tumors of the orbit and orbital new growths resulting from chronic inflammatory processes.

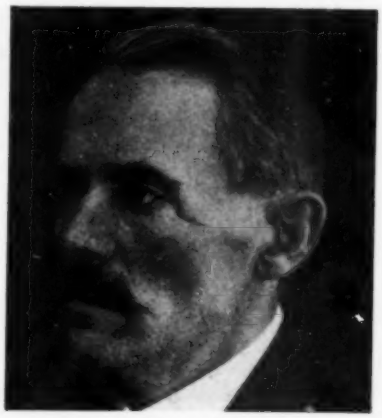
Incorrect diagnosis may lead to sacrificing a normal eye or to permanent interference with normal motility of the eye or lids.

A number of cases have been recorded in which the condition was cured, but not before surgical intervention had produced either loss of vision or other disturbances of function.

The case I wish to report is more especially of interest because the patient had been admitted to the hospital for an exenteration of the orbit, and at the last moment we changed our minds and decided to do a Krönlein operation, feeling that, if we found that the tumor was impossible to remove in its entirety, we could do an exenteration at a later time.

The patient was greatly surprised and delighted on the following day when he learned that we had not removed his eye.

Case history: Mr. J. R., aged fifty years, carpenter, Swede. For the past six years he has been having trouble with the left eye. This began as a swelling which developed slowly into a definite tumor mass in the outer upper part of the orbit. There was gradually increasing exophthalmos, with limitation of motion and partial loss of vision. Never had any injury or operation on the eye or head. The personal and family history are negative. The right eye is normal, with 20/20 vision. The left eye shows slight engorgement of the vessels of the lids and globe. There is a large sloughing ulcer of the lower two-thirds of the cornea, due to exposure from the great degree of exophthalmos. Vision—counting of fingers at eighteen inches. There is a very marked exophthalmos. The eye is pushed down and out, and it is impossible to force the eye back into the orbit, due to a hard, dense mass which can be readily felt in the upper outer part of the orbit. The tumor is smooth and round, and can be very readily palpated but is not movable under the fingers. There is marked limitation of motion, and the eyelid does not cover the cornea when the right eye is closed. An x-ray of the orbit and sinuses was negative. A Wassermann blood test was also negative.



Teratoma of lacrymal gland (Weidler). Postoperative appearance of patient.

Operation: A Krönlein operation was done under general anesthesia, and a large tumor mass measuring 23 by 22 by 20 millimeters was removed from the upper outer part of the orbit. The tumor was found to lie free in the orbital tissues and was easily shelled out of the orbit by the fingers. The lacrymal gland was also removed at this time, because we were of the opinion that the tumor might have originated from the glandular tissue. Subsequent study of the tumor showed this to be correct. The wound was closed at this time with silk tissue. There was very slight reaction of the orbital tissues, and the patient was discharged from the hospital two weeks after the operation. The corneal ulceration had healed, and the eye had returned to the orbit, with restoration of normal movements. Vision at this time was 15/200.

Laboratory report (Dr. Andrews Eggston): The specimen consists of a firm, partly encapsulated nodular tumor mass, measuring 23 by 22 by 20 millimeters. Upon cross section the cut surface appears trabeculated and presents several small, grayish-white

areas. Microscopic section shows tumor to consist of myomatous tissue, and connective tissue which in some areas shows cartilaginous metaplasia. These connective tissue structures surround glandular structures. Some of the glands show simple cuboidal epithelial hyperplasia. No mitotic nuclei are evident. In some areas there is lymphatic infiltration.

Diagnosis—mixed tumor of lacrymal gland (teratoma).

121 East Sixtieth street

LIGHT TRANSMISSION BY COLORED SPECTACLE LENSES IN THE VISIBLE SPECTRUM

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Tables are provided by means of which the relative value of different kinds of tinted spectacle lens and of gelatin ray filter, as applied to various purposes, may be estimated.

Information as to the transmission of light by colored spectacle lenses of various makes of optical glass is not available to the oculist or to the optician in readily understandable form. Under certain circumstances it would be desirable to know the behavior of various spectacle lenses with respect to the composition and amounts of light which they transmit. Many oculists do not know a number of these which are on the market nor their trade names, much less their physical characteristics. But there is a definite and growing use for such lenses, not alone in the field of sports but also in industry. Therefore a series of determinations have been made in order to ascertain the characteristics of a number of such lenses currently on the market, utilizing blanks as furnished by the manufacturers of a standard thickness of two millimeters.

With these data available, it should be quite easy for any oculist to prescribe a lens with definite knowledge of how much light and of what quality it will transmit. To this end the spectrum has been divided roughly into three parts, blue, green, and red. In general, lenses transmitting high values in the blue band will tend to increase the resolving power of the eye for close work provided the total illumination is adequate ($R = \frac{W.L.*}{2.\ N.A.}$),

* That is, where R=resolving power, W.L.=wave length, and N.A.=the numerical aperture.

but will reduce the resolution in distant vision because of their property of increasing the atmospheric haze effect. At ten thousand feet (Mount Wilson) the haze effect at a wavelength of 413 mm. was found to be 0.042; at 503 mm. to be 0.019; at 575 mm. to be 0.016.[1]

Lenses transmitting a great deal of light in the green band are very well tolerated. Because of the increased brilliancy of objects seen through such a lens, and because the definition obtained is good without marked increase in contrast values, these lenses are comfortable. In using these, it will be valuable to recall the Purkinje effect, namely that in light of great intensity the sensitivity of the eye is greatest in the green band (590 mm.), and that therefore lenses of greater density may be prescribed in this band without reducing too greatly the brilliance of green-reflecting objects.

Lenses transmitting high values in the orange or red may be useful where it is desired to obtain very detailed distant vision and exaggerated contrast, while if simply reduction of atmospheric haze is desired a lens transmitting the highest values in the yellow band should be used. In this connection it should be pointed out that there is a vast difference between orthochromatism and isochromatism. The requisite in the latter case is merely that all colors shall be trans-

mitted without respect to their relative natural luminosities, while the former requires all colors to appear in the order of their natural brightness. A lens which will satisfy the requirements of orthochromatism will be found to have a nearly equal transmission in all the color bands. Its density to white light may be small or great as long as the former condition is fulfilled. Too little attention has been paid to the function of the colored spectacle lens as a color filter, though many of them are admirably adapted to this purpose.

Table 1 was compiled from tests of the various lenses made with a photometer of the Martens type and using a standard source of illumination operated at the same degree of intensity throughout. Transmission was read direct as follows: $T = \cot^2$ (greater angle) $\times \tan^2$ (lesser angle), the logarithms of these angular values being used and the numerical equivalents read to three significant figures. The transmissions are plotted against the mean wavelength values of Wratten filters nos. 47, 58, and 29. From these values of T, the absorption and density values may be calculated if desired as follows:

1. Absorption $= 1 - T$, and
2. Density $= \log \frac{1}{T}$

1. TRANSMISSION OF LIGHT OF DIFFERENT WAVELENGTH IN THE VISIBLE SPECTRUM BY SPECTACLE LENSES OF COLORED GLASS

			Transmission in per cent			
No.	*Lens*	*Color*	*Blue*	*Green*	*Red*	*White*
1	Spectacle	White	93.50	94.00	87.00	93.72
2	Softlite	Lightshade	93.50	81.00	87.00	93.62
3	Amethyst	Number 1	85.00	87.00	79.10	86.99
4	Plate glass	White	86.50	87.00	94.00	86.78
5	Crookes	Number 1	93.11	80.54	96.00	86.30
6	Blue	"A"	99.54	81.10	86.50	86.25
7	Amethyst	Number 2	76.00	80.00	92.50	82.91
8	Softlite	Darkshade	89.00	75.50	86.90	81.16
9	Noviol	"B"	9.78	72.00	90.00	81.00
10	Hallauer	Number 62	10.56	87.50	66.00	80.78
11	Noviol	"C"	11.35	90.00	85.00	76.00
12	Amber	Number 1	69.00	82.00	80.50	75.20
13	Softlite	Sportshade	66.00	72.50	75.50	75.15
14	Fieuzal	"A"	59.57	80.13	80.36	73.29
15	Smoke	"A"	70.00	69.70	73.10	70.28
16	Amethyst	Number 3	65.00	69.75	69.10	69.90
17	Amber	Number 2	59.10	65.20	70.50	69.80
18	Uviol	Yellow	28.71	64.57	86.30	69.67
19	Amethyst	Number 4	60.20	60.80	75.30	65.30
20	Blue	"B"	75.69	69.67	60.40	65.17
21	Crookes	Number 2	75.34	74.82	80.73	65.02
22	Fieuzal	"B"	55.59	69.67	74.99	65.02
23	Amber	Number 3	40.50	54.20	69.20	61.60
24	Fieuzal	"C"	40.46	64.72	55.59	59.85
25	Smoke	"B"	52.00	51.50	55.00	52.06
26	Amber	Number 4	18.00	47.10	44.00	51.53
27	Crookes	Number 3	55.85	47.65	55.85	50.59
28	Hallauer	Number 63	15.70	37.50	40.28	40.37
29	Smoke	"C"	34.00	34.00	37.20	34.11
30	Blue	"C"	55.50	31.50	21.73	28.58
31	Amber	Number 5	11.50	21.20	29.80	24.10
32	Blue	"D"	40.94	19.68	12.39	15.82

Blue has a value approximately 4,500
Green has a value approximately 5,500
Red has a value approximately 6,500
White has a value approximately 5,800

By reading the column headed "white", the total transmission of white light (tungsten filament) may be obtained, the samples being so arranged that they appear in the order in which they transmit white light. By reading the columns from right to left, the transmissions at the other bands may be had. This arrangement permits a lens to be found immediately on the basis of the whole amount of light it transmits, and its differential transmission to be later read.

No attempt has been made to obtain a greater accuracy than ten per cent, since the color bands are broad. The object has been to present a practically graded table of the characteristics of the lenses tested for the use of oculists and opticians who might wish to take advantage of these. Since some lens must be worn to correct errors of refraction, it seems only common sense that that lens shall be utilized which most closely approximates the requirements of the individual case. Modern industry is making such demands and is requiring such a high degree of visual acuity and sustained visual effort that any aid or assistance which can be afforded the human eye, in the performance of work it was not primarily designed to do, is not to be overlooked. Micromeasurements are becoming every day more common, greater and greater accuracy is being required of the human eye. This is putting the responsibility squarely upon the oculist to obtain for those who consult him not alone a correct refraction, but also the highest possible visual acuity and efficiency. The use of color filters to promote this has not been carried to its logical limit, nor will it be until there is a more general understanding by oculists of the availability of this form of compound correction. The irritating quality of light in the ultraviolet has been stressed and overstressed, but very little has been said of the physical characteristics of the rays of the visible spectrum and how these might be adapted to practical uses. Those familiar with the practices of modern photography have long used light filters for the production of well recognized effects on photographic emulsions, but the use of such filters or modified forms of them

2. TRANSMISSION OF LIGHT OF DIFFERENT WAVELENGTH IN THE VISIBLE SPECTRUM BY GELATINE LIGHT FILTERS (WRATTEN).[3]

No.	*Filter*	*Transmission in per cent*				
		Blue	Green	Yellow	Red	White
1	No. 4	00.00	81.10	81.10	79.90	86.00
2	No. 9	00.00	78.30	78.30	78.30	80.00
3	No. 21	00.00	25.10	82.20	82.90	58.00
4	No. 23	00.00	00.00	66.50	76.10	33.00
5	No. 30	38.10	00.00	74.00	79.40	42.00
6	No. 34	39.70	00.00	00.00	4.60	1.30
7	No. 38	70.80	49.00	26.20	9.10	38.00
8	No. 40	00.00	50.60	5.00	00.00	38.00
9	No. 43	61.40	15.00	1.10	00.00	12.50
10	No. 51	37.00	74.50	64.50	43.20	70.00
11	No. 60	00.26	38.10	1.78	00.00	25.00
12	No. 88 Infrared	00.00	00.00.	00.00	00.00	00.00
		MONOCHROMATIC FILTERS				
13	No. 70	00.00	00.00	00.00	74.50 650 mm.	00.60
14	No. 71	00.00	00.00	00.00	9.20	1.00
15	No. 72	00.00	00.00	1.14	00.37	1.00
16	No. 73	00.00	00.00	2.68	00.00	3.30
17	No. 74	00.00	4.00 500 mm.	00.00	00.00	3.30
18	No. 75	00.00	14.10	00.00	00.00	1.50
19	No. 76	9.50	00.00	00.00	00.00	0.10

in combination with correcting lenses has not yet been intelligently developed.

While the coloration of optical glass is practically limited by the conditions of manufacture, it is practical to use ordinary gelatine filter material placed between thin wafers of glass and mounted in a fitover frame, thus affording a great variety of filter effects not at present obtainable otherwise. Monochromatic light may thus be utilized or any desired band at will with great ease. A field for such filters has recently developed with the popularity of the infrared as a therapeutic modality. None of the sources of infrared as found currently on the market are satisfactory, in that they are far from being monochromatic, some of them emitting light as far down as the blue-green. But by using gelatine filter Wratten no. 88 suitably mounted, it is possible to employ almost pure infrared emanations from sunlight or other sources for treatment purposes, and to be sure of the exact composition of the light used. (Table 2.)

With the information afforded by these tables it should be possible to control with some exactness the prescription of colored glass lenses, and to have at hand for further experimental work data as to the characteristics of some of the commoner gelatine filters which may be used as adjuncts.

The Andrew Todd McClintock Memorial Foundation,
285 Madison avenue

References

1. Aerial haze, monograph no. 4. Eastman Kodak Co., 1923, p. 77.
2. Wratten light filters. Eastman Kodak Co., 1925.

THEORIES OF ACCOMMODATION

M. URIBE TRONCOSO, M.D.
NEW YORK CITY

Recent investigations bearing upon the two principal theories as to the mechanism of accommodation, namely those of Helmholtz and Tscherning, are summarized and discussed.

The mechanism of accommodation has been so much discussed, and such different and contradictory theories have been maintained upon the subject, that new facts are always welcome, particularly in regard to the condition of the zonule. The old controversy between the two principal theories—namely, that of Helmholtz as to relaxation of the zonule and lens capsule during accommodation and that of Tscherning and others, which considers tightening of the zonular fibers and compression of the lens as the principal factors in accommodation—is still open.

The biomicroscope (slit-lamp) has proved of considerable value for the study in vivo of the condition of the zonule and lens when these structures become visible in cases of congenital or operative colobomas, irideremia, ectopia lentis, and so on. The appearance and structure of the zonule and lens margin have been carefully studied with the biomicroscope, both in enucleated normal eyes and in patients in whom these parts were exposed to view. The findings of Meesmann, Treigny and Bernard, and Mawas confirmed the histological descriptions of the zonular fibers and their mode of attachment to the periphery of the lens on its anterior and posterior surfaces.

To direct and indirect illumination the fibers appear as straight, brilliant, golden filaments arranged in groups, each of which corresponds to the head

of a ciliary process and merges abruptly by a line (not a point) of insertion with the lens capsule at different levels. Under direct illumination the border of the lens appears as a brilliant white, silvery crescent. The physiological problems to be investigated by means of the biomicroscope are twofold: (1) as to the change in the shape of the lens during accommodation; (2) as to the condition of the zonular fibers while this process takes place.

According to Helmholtz, the lens assumes during accommodation a spherical shape, particularly on its anterior surface; the lens fibers distending themselves like a coiled spring when the pressure made on them by the lens capsule ceases during contraction of the ciliary muscle. The posterior surface, restrained by the vitreous, moves backward in much lesser degree. Tscherning, on the other hand, asserts that during accommodation the anterior surface of the lens takes a somewhat conical shape (anterior lenticonus), or more accurately a hyperbolic curvature, the center greatly increasing in refraction while the periphery moves backward. He does not believe that in the majority of cases the lens advances into the anterior chamber. His assertions were supported by a great number of experimental researches, in which he observed the changes in the Purkinje images during accommodation, greatly amplified by a very accurate instrument, which he called the ophthalmophacometer. Tscherning's measurements were confirmed by many authors, especially by Crzellitzer and Stadfelt, and seemed so conclusive that for many years the Helmholtz theory lost ground steadily.

With the biomicroscope Fincham has recently confirmed Tscherning's views. Using a camera and a device which recorded photographically the Purkinje images of the lens surface, Fincham found that the anterior surface assumed a hyperbolic curve in accommodation, the apex rounding into a spherical curve in the pupillary area. In a case of aniridia Story found diminution of the equatorial diameter, especially under eserin.

It seems, therefore, that in the act of accommodation the lens increases in thickness and decreases in diameter, the anterior surface bulging forward and taking a hyperbolic curvature at the same time that it advances into the anterior chamber.

In regard to the condition of the zonule during accommodation, the biomicroscope has furnished very interesting data. In 1925 Basil Graves presented to the American Ophthalmological Society a paper describing a case in which he was able to observe tension upon the lens capsule during distant vision and relaxation of the capsule during accommodation. In this case the entire lens had become absorbed after trauma. In the May number of this Journal A. L. Brown reported another and perhaps more conclusive case in which he was able to see the zonule and periphery of the lens through a nasal optical iridectomy. When the patient looked into the distance, or under the use of atropin, the zonular fibers were seen to shimmer and fine crenations appeared at the insertion of the fibers into the capsule. Brown compares these crenations "to those seen in the back of the hand when a bundle of fine hairs are pulled up." When the patient accommodated as fully as possible, the insertion of the fibers was smooth and merged into the capsule. Eserin dropped into the eye had a similar effect.

These crenations or elevations of the capsule prove that the fibers are tenser in distant vision, when the lens is at rest, and relax during accommodation. Moreover, Brown was able to observe that the anterior surface of the lens moved steadily forward during accommodation, a fact disputed by Tscherning but fully admitted in the relaxation theory. The shadows cast by the anterior ciliary processes also moved forward, but it is not recorded if the distance between the edge of the lens and the ciliary processes remained the same or increased. A careful examination showed that the periphery of the lens

was not flattened by the fibers during accommodation, as Tscherning had thought, as no grooves could be seen even when the fibers were most taut. Tscherning's idea that the zonular fibers were pulled upon by the ciliary muscle during accommodation and held the lens fixed against the vitreous, became untenable when Hess, Heine, and others brought forward two new facts: (1) the tremulousness of the lens during maximal accommodation; and (2) its descent, according to the laws of gravity, when the subject's head was turned to one side.

This tremulousness might be explained, as Obarrio has suggested in this Journal, by a vibratory movement of the lens due to clonic contractions of the muscles and of the taut fibers, but downward movement of the whole lens could not occur with a lens held firmly around its periphery by a tight capsule. Some years ago the writer (Ann. d'Ocul., March, 1900) tried to reconcile these facts by assuming that it was not the lens as a whole which moved downward, but only the soft cortex which accumulated and bulged forward in front of the nucleus during maximal accommodation. It will be remembered that from the physical standpoint the lens is made of two substances, the hard unyielding nucleus, and the semifluid cortex. The condition of anterior lenticonus during accommodation can only be produced by pushing forward of this semifluid cortex. Recently Obarrio has explained the same fact as due to tilting of the lens. Long ago, however, in a patient with a partial cataract, Hess was able to observe that it was really the lens as a whole which descended in different directions according to the tilting of the head.

In the light of new researches, especially those made with the biomicroscope, the relaxation theory appears once more as the true explanation, if combined with Tscherning's conclusions as to the hyperbolic curvature of the anterior surface. To many authors the relaxation theory is repugnant, because they consider it in opposition to the ordinary mode of muscle action elsewhere in the body. Tscherning, on the contrary, assuming that contraction of the ciliary muscle pulls back the fibers of the zonule and flattens the periphery of the lens, considers these fibers as real tendons of the ciliary muscle, which work on the usual physiological principle. To this conception, however, must be opposed the fact that the annular fibers of the ciliary muscle, which are the more developed and the more active in hyperopia, act probably as a sphincter which, when contracted, pulls the ciliary processes in a concentric direction toward the sagittal axis of the globe. The zonular fibers are not really the tendon of the muscle, but belong to a different organ, the lens. The true tendon of the ciliary body is inserted at the sclerocorneal margin and corresponds to the longitudinal fibers, to which it gives a fixed end, drawing forward the choroid and pressing upon the vitreous.

If we accept a combination of the fundamental facts of the two theories, the relaxation of the zonule and the bulging of the anterior surface of the lens in a hyperbolic curve, which the new investigations with the biomicroscope seem to prove, there is still a gap in our knowledge. The condition of anterior lenticonus is very difficult to explain by regarding the capsule as totally relaxed. Why is it that the diameters of the lens diminish in the plane of the equator during accommodation, at the same time that the anterior pole bulges forward? Two factors must be responsible: (1) the elasticity of the lens fibers, with unequal resistance by the cortex and the nucleus; and (2) the elasticity of the capsule itself.

It is a proved fact that the lens is plastic enough to change its own shape during contraction of the ciliary body: this is the "physical" accommodation of Fuchs. The hard nucleus being unyielding, it is the cortex which shifts from the equator to the center and to the anterior surfaces of the lens. The lens fibers are kept compressed by the taut capsule during distant vision.

With this physical condition the ciliary body should have little to do; but in accommodation it is most probable that the pressure of the vitreous associated with the action of the longitudinal fibers of the muscle will support the cortex backward, while the elasticity of the lens fibers pushes them forward, and causes bulging at the pupil.

Another important factor is perhaps the elasticity of the capsule. Fincham ascribes to this the principal rôle. He believes that this membrane varies in thickness, being thicker at the periphery and thinner at the anterior pole, and this would account for the lens flattening at the equator and bulging at the anterior pole when put under tension. At the posterior pole the capsule is very thin, and according to Fincham the maximal curvature develops there, even when no accommodation is present. It is, however, difficult to believe that, while the membrane is relaxed during accommodation, the elasticity of the capsule alone would be enough to produce tension sufficiently active to pull the lens matter forward. The complicated question of the mechanism of accommodation is still open to discussion, and new researches are necessary before it can be regarded as entirely settled.

515 West End avenue

IRIS PROLAPSE FROM CORNEAL ULCER: TREATMENT BY CONJUNCTIVAL FLAP

R. A. Peterson, M.D.
NANKING, CHINA

Iris prolapse from corneal ulcer is common in China. Thirty-eight such cases were treated with a sliding conjunctival flap, using mattress sutures for firm fixation, excising the prolapsed iris tissue. Visual iridectomy was done after two weeks. Read before the Section on Ophthalmology of the China Medical Association at the eighteenth biennial conference in Peking.

Due to the frequency of ulcer of the cornea, with lack of proper care, iris prolapse incidental to perforation of the cornea during corneal ulceration is frequently met with in China. In a period of fourteen months from the first of May, 1925, to the first of July, 1926, fifty-four cases of this condition were seen in the ophthalmological clinic of the University Hospital at Nanking. Operation was advised and accepted in thirty-eight cases and this report is based on a study of these cases.

There were twenty-nine males and nine females. The cases ranged in age from eight to fifty-two years. Both eyes were involved in thirteen cases, four of which had a gonorrheal conjunctivitis, while three of the remaining nine cases had a gonorrheal urethritis but conjunctival smears negative for gonococci at the time of admission. Three cases gave clinical and laboratory evidence of syphilitic infection. Poor general nutrition was present in nineteen patients. Intestinal parasites were found in twenty-one.

The lesion was located in the upper half of the cornea in thirty-six of the thirty-eight cases. The mass of iris tissue extruded varied from two millimeters to ten millimeters in diameter. The diameter of the corneal perforation tended to be about half of the diameter of the mass extruded.

Preoperative treatment consisted of thorough elimination, the treatment of any other pathology present, and the clearing up of the conjunctival inflammation to a point where the conjunctival sac was free of pathogenic organisms. Trachoma if present seemed no contraindication to operation of not active. The lacrimal drainage was investigated in each case. Silver nitrate and atropine sulphate in one per cent solutions were used routinely for several

days preceding operation. Except in younger cases where full cooperation could not be assured, local anesthesia was used. Bichloride of mercury (1 to 10,000) and normal saline irrigations were used before operation.

The operative treatment of these cases consisted in the preparation of a large conjunctival flap, the placing of two mattress sutures needed for firm fixation, excision of the prolapsed iris tissue, and tying of the sutures. Pedunculated flaps as described by Kuhnt were found unsatisfactory, and were early discarded in favor of a flap formed by the undermining of a large apron of conjunctiva and drawing it down over the corneal perforation. Since a large majority of the perforations occurred in the upper half of the cornea, the bulbar conjunctiva of the upper conjunctival sac was used in constructing the flap.

The conjunctival incision freed the conjunctiva around the upper half of the corneoscleral margin. The ends of the incision were prolonged down and away from the cornea. To secure enough conjunctival tissue to cover the corneal defect without subjecting the flap to too much tension, the conjunctiva was undermined freely to the fornix and laterally as far as the canthi if necessary. Care was taken not to buttonhole the conjunctival flap by too superficial dissection and also not to injure the subconjunctival structures by going too deep. With the recumbent patient looking directly at the ceiling, the dissected conjunctiva should reach three millimeters below the corneal defect without undue tension.

The mattress sutures were then placed, using a strong vaselined silk as a doubly armed suture. A bite about four millimeters in length was taken in the conjunctival flap, beginning from above down on a level with the upper margin of the cornea and just outside the plane of the lateral margin of the cornea. A similar bite was then taken in the conjunctiva about four millimeters below the end of the incision and at a slightly greater distance from the cornea. The inclusion of subconjunctival and a few scleral fibers in the lower bite of the suture aided in firm fixation. The same process was repeated with the other arm of the suture about four millimeters lateral to the first arm. The second mattress suture was then placed in position on the opposite side of the cornea. Single sutures were unsatisfactory, as they tended to cut out on the third day, and our experience showed that six days was the minimal time of holding the flap in position to secure a good result.

The sutures placed, the prolapsed iris tissue was excised flush with the cornea. Meller's observation on the inadvisability of dissecting the iris free from the inner edge of the corneal perforation was in accord with our experience. Curettement of the outer edge of the perforation aided in securing early and firm attachment of the conjunctiva. Care was taken to avoid injury to the lens as the aqueous escaped and the lens floated forward. Excision of the iris tissue completed, the patient was told to look continually up toward his forehead and the sutures were tied. Atropine sulphate and one of the solutions of silver proteid were then instilled and a firm dressing applied over both eyes.

The patient was kept in bed for a day and was cautioned not to touch the dressing or to open his eyes. At subsequent dressings, he was cautioned not to look down, so as to avoid tearing out the sutures. As a rule, the sutures were removed on the seventh day and the eyes were left open on the eighth day. An optical iridectomy was done after the second week. The false ptyergium remaining after retraction of the excess of conjunctival tissue was not disturbed for at least two months. At the end of this time, if thought advisable, its neck was divided and the redundant tissue removed or transplanted.

The immediate results from this procedure were very encouraging. Of the thirty-eight cases of hernia of the iris which came to operation, twenty-nine had a primary attachment at the first operation. Of nine cases in which

a second operation was advised, six consented and five of these six cases had a successful result. In six cases securing a good result from an operative standpoint, there was no improvement of vision because of intraocular pathology. In twenty-eight out of the thirty-four cases that had a good operative result, there was definite improvement of vision, the final visual acuity ranging from 20/200 to 20/20. There was relief from subjective symptoms, and the infiltration of the cornea showed marked diminution in cases in which the opacity was not of too long standing. Visual iridectomy was done in twenty-eight cases.

University Hospital

NOTES, CASES, INSTRUMENTS

THE CARD PROPTOMETER

EDWARD JACKSON, M.D., F.A.C.S.
DENVER

A convenient method of measuring the prominence of the eyeball with practical accuracy has been widely needed. In 1903 the writer had such an instrument made of wood, and described it in the American Journal of Medical Sciences, volume 125, page 95. It was also shown at the Section on Ophthalmology of the American Medical Association in 1921; and figured in the Transactions of the Section (p. 342). It has been produced by some of the writer's friends, for their own use, both in celluloid and in aluminum. But it is still not used as generally as it should be. It is now printed on stiff cardboard, and in this form is found serviceable and practically accurate.

The line from which the prominence of the center of the cornea is to be measured is the line joining the outer margins of the orbits. This was chosen by the author in 1903; and it was independently selected by Hertel (Graefe's Archiv für Ophthalmologie, 1905, v. 60, p. 171) as the line for the application of his "exophthalmometer". The card is applied to the orbital margins, with the curve toward the face and the printed side up. The eye is looked at from the side, along the lines of the millimeter scale, to note which line coincides with the most prominent point of the cornea. The prominence of the cornea is thus known within one-half millimeter, if the plane of the card is made to coincide with the plane of the visual axes in the primary position. The proptometer can also be used to measure the protrusion of the lashes, or of the bridge of the nose.

217 Imperial building.

ANKYLOBLEPHARON*

FRANK H. RODIN, M.D.
SAN FRANCISCO

Ankyloblepharon is a condition in which there is an adhesion of the eyelids along the palpebral margin, which may be partial or total. It is rarely congenital. As an acquired affection it follows ulceration, burns and other injuries. It results from the growing together of two raw surfaces.

Rodin's case of total ankyloblepharon due to a burn.

W. W., male, aged sixty-six years,

*From the Division of Ophthalmology, Stanford University Medical School.

was seen June 23, 1927. Twenty-two years previously the right eye had been burned with a hot iron in an accident.

Examination revealed that there was a complete cohesion of the eyelids of the right eye. A faint longitudinal depression was present where the eyelids were united together (see illustration). At the outer third of the adhesion a small opening, a millimeter in diameter, was present, into which a probe could be passed for two millimeters, the movement of the probe ending in a blind pouch. A few poorly developed cilia projected from the opening, and the patient stated that tears occasionally appeared there. A shrunken eyeball was felt through the eyelids.

490 Post street

CLONUS OF THE INTERNAL RECTUS

J. J. Horton, M.D.
EAGLE PASS, TEXAS

I have access to a very meager ophthalmic library, and cases similar to this one may have been previously reported. This is the only one I have seen. I wanted to call it "tic" of the internal rectus, but I find that tic is now defined as a psychoneurosis (medical dictionary, Dorland, eleventh edition), and I do not think this patient's mental processes played any part in the action of the muscle.

In the town of Cuatla, Morelos, Mexico, it is the custom of many of the male population to get drunk on pulque Saturday evening and to remain so until Monday morning. Following the intoxicated period is the "cruda" or raw state, corresponding to our "morning after the night before".

One Monday morning I was approached by a native of Cuatla asking alms and evidently in the "cruda" state. I noticed a peculiar jerking of the left eye. Upon closer examination it was seen that the left eye was jerked suddenly medialward, then released, and slowly resumed its primary position. This appeared to be due to a sharp contraction of the internal rectus followed immediately by its gradual relaxation. These spasms were at the rate of about fifteen per minute, and there would be a series of about eight to twelve of them at a time, but they were not regular in time or force. The patient might have one series or several before having a period of considerable quiet. The patient stated that the attack usually continued over a period of one day, and only after debauches—when he was in the "cruda" state; that he had been so affected about one year; that the seizures caused him no pain and very little discomfort; and that the right eye was never affected.

I examined him the next day, and both eyes appeared normal in every respect, including freedom of movement. He had not had an attack that day and was over his intoxication.

It is hardly possible that the cause of the phenomenon lies in a specific toxin of pulque or of the magüey of which it is made; otherwise cases would be frequent. Its etiology is more likely the same as that of the similar contractions of fibers of the orbicularis or other facial muscles which are so common.

"AUTO GOGGLES" TO HOLD RED GLASS FOR MUSCLE TEST

L. L. McCoy, M.D.
SEATTLE

In the use of the ordinary red lens from the trial case in testing for muscular imbalance, considerable difficulty is often encountered in getting the patient or assistant to hold the lens over the eye properly while the muscles are tested in the various extreme directions.

To facilitate a more accurate examination and to avoid having the patient keep his mind on holding the lens rather than on the light, a convenient instrument can be made from a pair of "auto goggles" of the type known commercially as the "Wellsworth autoglas," the red glass being substituted for one of the lenses. There are several advantages in the use of this contrivance. (1) The red glass is larger than the trial case lens, allowing the eyes to be moved in practically extreme directions without chang-

ing the position of the lens. (2) The frame containing the red glass can be placed on the patient's nose, allowing the patient to keep his attention strictly on the lights. (3) The examination is done more quickly and with less explanation by the examiner.

817 Summit avenue.

BIFOCALS FOR GOLFERS

HENRY W. CHAMPLIN, M.D.
TOWANDA, PENNSYLVANIA

Presbyopic golf players have been offered bifocals with very small reading segments located as usual in the lower portion of the distance correction. Even these small segments are very apt to distort the vision and occasion a bad stroke. The small size so located is almost valueless for reading, and is the cause of great inconvenience and discomfort.

I have devised a lens for golf players and others in which the segment for near use is located at the top of the distance lens. This affords a clear and unobstructed field for hitting the ball. In case of high refractive defects much better results are had if the distant correction is always used. Reading is readily accomplished by using the upper portions of the lenses; this is facilitated by pulling the frame down on the nose as permitted by cable and skull temples. I have found these lenses much appreciated for street use, shopping, touring, and the movies. We are all getting prematurely stooped by looking over our bifocal segments; but with the latter located as herein described we shall soon have a better pose.

I am indebted to Mr. L. W. Bugbee, Jr., for valuable advice in the matter of producing the lenses as described.

SOCIETY PROCEEDINGS

COLLEGE OF PHYSICIANS OF PHILADELPHIA

Section on Ophthalmology

February 16, 1928.

DR. C. E. G. SHANNON, chairman

Further report upon an orbital tumor

DR. H. O. SLOANE (by invitation) reported on this case presented before the Section a few months previously, prior to operation. At that time, the patient, a youth aged nineteen years, presented a marked displacement of his right eye together with its appendages, so that it was fifteen mm. below its fellow eye and proptosed about four mm. There was tumefaction below the supraorbital rim but no inflammatory symptoms. The mass was fairly firm to touch, but not hard. It could not be indented. There was an optic neuritis and vision was reduced to 20/200. The conjunctiva was slightly injected; the cornea had a small nebula in the center; the pupil was regular and reacted normally to light and convergence. Rotation was limited upward. The palpebral fissure was two millimeters narrower than the left. Tension was normal. The left eye was normal.

The patient was studied at the Mount Sinai Hospital and found to be normal from both a serological and a medical standpoint. The x-ray showed some separation of the sutures of the skull, but a normal sella turcica. The ethmoids and sphenoids were cloudy and the right frontal sinus was small and cloudy. The right orbit was enormously enlarged and there appeared to be a direct communication with the frontal sinus. Field studies showed slight enlargement of the blind spot and a concentric contraction for form and colors.

At operation there was found a mass of grayish white tissue, lying perfectly free in the orbit and not encapsulated, consisting of many particles, both large

and small, soft in consistence, the larger ones appearing to have convolutions similar to that of brain tissue, filling the entire cavity and plugging the sphenoidal fissure, through which channel it appeared to be forcing its way. No attempt was made to enter the fissure. The orbital plate of the ethmoid bone was fractured and displaced in the cavity, but it was not necrosed. No communication was found between frontal sinus and the cavity. A diagnosis of cephalocele was made at operation (Dr. C. W. LeFever). Only an inconclusive laboratory report had thus far been made.

Following a good recovery the vision was 20/20 in this eye. The optic neuritis disappeared and the field studies showed a very slight degree of enlargement of the blind spot. There was still some concentric contraction, especially of the upper field. With suitable prisms binocular vision without diplopia was obtained.

Discussion. Dr. Edward A. Shumway said that the pathologist's report of the presence of degenerated, grumous material, and apparent extension through the sphenoidal fissure, suggested a dermoid or cholesteatoma which had entered the orbit from the cranial cavity. A number of such growths had been reported. The cholesteatomas were more common in the region of the pituitary body, as an outgrowth from Rathke's pouch, from which the anterior part of the pituitary body developed while the dermoids more frequently arose in the pineal region.

Dr. Sloane, closing, stated that none of the characteristic tissue of dermoid was found in the mass either macroscopically or microscopically, as reported by the laboratory findings. Furthermore, the x-rays showed no involvement of the sella turcica or pineal gland. The theory of cephalocele was based on the fact that the x-ray showed a separation of the sutures of the cranial vault, indicating that there must have been some intracranial pressure during infancy or even prenatally and that this had gradually forced some of the brain tissue through the sphenoidal fissure.

As to the question of mucocele raised by Dr. Holloway, there was no glairy mucus in the mass, and it was not encapsulated. At first it was thought possible that there was some degenerated polypoid tissue coming from the frontal sinus, but no communication with the frontal sinus was found. The displaced bone was the paper plate of the ethmoid and was fractured due to constant pressure. This, however, was not diseased bone and showed no evidence of necrosis.

A case of congenital disc-shaped cataract.

Dr. William Zentmayer reported the case of a white child, two years old, who had in each eye a dense white disc-shaped opacity, about 2.5 mm. in diameter, surrounded by a striated zone of lesser density, in the pupillary area behind the plane of the iris. An incision was made in the medial circumference of the opacity, causing the opaque disc to move to the side and leaving a clear opening through which the fundus could at once be seen. The fellow eye was operated upon in the same manner, with a like result.

This rare type was described by Collins as due to failure of development of the lens nucleus, so that the anterior and posterior capsule were joined by a short strand of laminated tissue. There was imperfect development of the cortical layers, the whole lens presenting in section a dumb-bell shape.

Reference was made to the report of a case by the author in 1910, in which the procedure suggested by Collins, of flaking off the opaque disc, was employed, but it fell into the posterior chamber. A severe iridocyclitis followed which might have resulted from the presence of the foreign body in this position.

Neurofibroma of the orbit; operation; pathological report

Dr. G. E. de Schweinitz and Dr. B. F. Baer, Jr., described a tumor in the

lower and outer quadrant of the orbit of a man aged thirty-six years, which had been noted about one year prior to operation. The growth was removed by Dr. Baer. Three years after the operation, the position, rotations and functions of the eye were normal and there was no sign of recurrence or metastasis. Microscopic examination of the neoplasm revealed the structure of a neurofibroma.

Concerning optic pseudoneuritis

Dr. G. E. de Schweinitz, after a brief review of the literature pertaining to the subject, agreed with those authors who objected to the term "hyperopic disc", because the degree of hyperopia bore no relation to this anomaly, and because it might be evident in emmetropic eyes (as Spicer had proved), and furthermore, it was reported to have been observed in association with myopia. "Pseudoneuritis", or "spurious optic neuritis," was a better descriptive title.

Four types of pseudoneuritis were commonly observed: (a) discs over red or grayish red, their margins veiled or hidden, especially on the nasal side, but often also above, below, and on the temporal edges, blending with the surrounding area of fine grayish lines and minute arterioles ordinarily invisible; (b) somewhat similar appearance, associated with what Fuchs described as a cloudy gray areola about the disc, and with either of these types the veins might be tortuous and the perivascular lymph sheaths unduly prominent in the form of white lines along the central vessels, especially the veins; (c) a prominent feature might be that the disc was covered with, and obscured by, a layer which blurred the margins and gave the impression of a transparent injected edematous tissue; (d) the disc, entirely obscured, might be somewhat mound-shaped, elevated, of a marked grayish color, very similar in appearance to a late or subsiding stage of papillitis or papilledema.

Group one probably presented eye strain manifestations, which might subside or improve after proper correction of the refractive error and hence were not permanent, and did not properly belong to the pseudoneuritic class. Group two had manifestations which were permanent, which were congenital in origin, and which formed the proper class of "pseudoneuritis", and might be found in members of the same family. Group three exhibited disc changes named "pseudopapilledema", which probably represented a persisting and perhaps congenital form of edema. Group four represented a congenital familial type of choked disc, or papilledema, which belonged in a class of its own.

All these types were most satisfactorily studied by means of the Gullstrand binocular ophthalmoscope, and an important aid in differential diagnosis was afforded by repeated careful perimetric investigation of the blind spot area.

Discussion. Dr. Luther C. Peter, after emphasizing the importance of the Gullstrand in the diagnosis of pseudoneuritis, said that there was a definite difference between the blind spot in pseudoneuritis, in genuine choked disc, and in optic neuritis. If we were to include all the types of cases which Dr. de Schweinitz had shown, there would be some definite enlargements of the blind spot in some of the groups. The familial groups, especially, would show definite blind spot enlargement. Perhaps it would be best, in this differentiation, to depend upon the constancy of the enlargement in pseudoneuritis, if enlargement of the blind spot were present, and upon increase in the enlargement when the optic nerve disturbance was due to mechanical pressure or inflammation.

Dr. George Schwarzkopf, of Atlantic City, N.J., said that, beside the binocular Gullstrand, perimetry in a dimmed room might help in the often difficult differential diagnosis. In beginning choked disc, the blind spot was enlarged more distinctly in dimmed illumination than in ordinary illumination. This applied in lesser degree to optic neuritis with which lack of dark adaptation was more pronounced.

Pseudoneuritis did not show any of these symptoms.

The newer ophthalmic lenses

DR. ALFRED COWAN, in a comprehensive and technical paper, pointed out that there were so many inconstant factors in the practical adjustment and use of lenses that even the most carefully designed lens must vary from the theoretical requirements for an ideal lens. Since the difference between secret formula lenses and toric lenses was after all very small, there was no doubt that positive lenses up to seven diopters, given a base curve of —6 diopters, would practically answer every purpose of a point focal lens.

LEIGHTON F. APPLEMAN,

COLLEGE OF PHYSICIANS OF PHILADELPHIA

Section on Ophthalmology

March 15, 1928

DR. C. E. G. SHANNON, chairman

Unusual case of persistent pupillary membrane

DR. THOMAS B. HOLLOWAY and DR. ALFRED COWAN presented a patient in both of whose eyes with the slit-lamp could be seen several greyish deposits near the center of the posterior surface of the cornea, with several tiny brown pigment tags attached, possibly the remains of pupillary membrane. There were numerous punctate pigment deposits more or less scattered over the whole posterior surface. The aqueous and iris showed no abnormalities. The deposit on the anterior surface of the lens was of a thin membranous nature, in circular arrangement, with many of the edges free and extending into the anterior chamber. To a number of these were attached tiny tags of brown pigment. The larger areas of adherent membrane seemed to be composed of tiny white dots. In the center of the pupillary space were numerous brown pigment remains in the form of clumps. None were of the star-shaped variety. By retroillumination, only the pigmented portions of the membrane appeared opaque. With the narrow slit it could be seen that the membrane lay on the anterior capsule, which was everywhere intact.

Lens proteins in senile cataract

DR. I. S. TASSMAN read a paper reviewing the recent literature on this subject.

Cavernous sinus thrombosis

DR. LUTHER C. PETER described three cases. The first case occurred in a priest, forty-six years of age, in whom the etiological factor was a much lowered vitality from overwork, and probably a small central pneumonia. The blood culture showed the presence of a pneumococcus. The patient's symptoms included proptosis, limitation of movement, disturbance of the nerve head, and blurring of vision, first in one eye and then in the other, accompanied by a hectic temperature, some delirium, cough, and expectoration. The case cleared after about four weeks. The medication consisted of supportive measures, and the free use of Pregl's solution intravenously. This first case belonged to the marantic group.

The second case was one which Eagleton classifies as "parietal thrombophlebitis." It occurred in a man of fifty-nine years, with a bizarre history of giant uticaria and other toxic symptoms for two years past. The first symptoms noticed were chemosis of the conjunctiva and swelling of the lids, first in the right eye and then in the left. The temperature ran high; the white cell count was 20,500 with ninety-seven per cent polynuclears; and the nasal examination revealed the presence of chronic hyperplastic sinusitis, with necrosis especially on the left side. Following sinus operation by Dr. Ridpath, the case made an uneventful recovery in about four weeks. There remained at this time but slight limitation of movement of the left eye to the outer side, and conjunctival redness. The blood culture was negative.

The third case was that of a woman of sixty-eight years. She had a history of cardiovascular-renal disease, and developed the usual signs of cavernous sinus thrombosis, first in the right eye and then in the left, with a remission in the right. In addition, there developed a pronounced exophthalmos in the left eye, with a definite, palpable pulsation, and a bruit synchronous with the systolic beat. The white cell count was 18,500, and blood culture showed the presence of staphylococci. The blood pressure was 200 mm. Hg. The patient was paralyzed for several weeks. Examination of the sinuses by Dr. Ridpath showed chronic disease of the sphenoids on both sides.

Discussion. Dr. Edward A. Shumway had never seen a case of true cavernous sinus thrombosis recover. In one patient at the Philadelphia General Hospital, Dr. Fielding Lewis had proposed enucleation of one eyeball, and entrance into the sinus by way of the posterior wall of the orbit, but operation had been refused by the patient's family and the man died.

Dr. Warren S. Reese told of a baby who was recently admitted to Wills Hospital with marked swelling of the lids of the left eye. Within two days the right lids became swollen, and he made a diagnosis of cavernous sinus thrombosis. Pus was then obtained from the left orbit and the child went on to recovery. Evidently the swelling of the right lids was of the type transmitted across the nose, although it did not appear to be such clinically.

Cavernous sinus thrombosis and pulsating exophthalmos seemed to Dr. Reese incompatible. It was quite generally accepted that the pulsation in pulsating exophthalmos was transmitted from the internal carotid artery through the cavernous sinus, back to the veins of the orbit. If the cavernous sinus were thrombosed, this pulsation would be cut off. It seemed impossible that such a pulsation could be transmitted by contiguity of tissue in this region.

Dr. Frederick Krauss stated that he had seen a number of cases such as described by Dr. Peter, in which he felt that the exophthalmos and immobility of the eye and the chemosis of the lids were in the nature of an inflammatory edema rather than a true thrombosis of the cavernous sinus.

Dr. Krauss operated immediately in these cases by the external sinus operation method, and usually found a drop or two of pus over the os planum, in the neighborhood of the ethmoid vessels at their point of exit and entrance into the orbit. He usually found a carious spot in the bone in this region. The os planum is very thin and free drainage is readily established into the nose. In using the curette, care must be exercised to stay below the level of the anterior and posterior ethmoidal vessels. The operated cases always got well in a few days, usually with perfect restoration of muscle function.

Lantern slides from uncommon fundus photographs

Dr. Arthur J. Bedell presented many photographs of unusual fundus lesions.

Measurements of the blood-free area of the retina

Dr. Francis Heed Adler, with J. S. Sperling and H. Miller (by invitation), explained that the entoscopic method of studying the retinal circulation had been used for measurement of the blood-free area of the macula in a series of normal eyes. It was found that in a great majority the diameter of the macula free from capillaries was 0.4 to 0.5 mm., which is in agreement with the figures found by injection and histological examination of the capillaries. The difference in the size of this area in the two eyes of the same individual was usually less than 0.05 mm.

This study was undertaken in the hope that in amblyopic eyes some change in the retinal circulation might be found which could account for the poor vision; for example, an encroachment of the capillaries on the foveal cones. Only one amblyopic eye was examined, and this did not show any great departure from the normal. Fur-

ther, in one normal individual with normal vision there was practically no capillary-free area in either eye. The method might have some use in the examination of patients with vascular changes and poor central vision without evident fundus pathology.

LEIGHTON F. APPLEMAN, M.D.,
Clerk.

COLLEGE OF PHYSICIANS OF PHILADELPHIA

Section of Ophthalmology

April 19, 1928

DR. C. E. G. SHANNON, chairman

Punctate hyalitis?

DR. L. WALLER DEICHLER reported the case of Miss C. W. E., aged forty years. She gave a history of having had attacks of articular rheumatism since eighteen years of age, with a severe attack in 1918, which confined her to bed for five weeks. The tonsils were found diseased and were removed at that time. In May, 1927, she noticed marked blurring of vision, especially for close. In February, 1928, vision in the right eye was 20/50; and in the left 20/70 unimproved by glasses. There was a slight divergent strabismus in the left eye, but the eyes were otherwise normal externally. There was a general anemia.

Ophthalmoscopic examination of the right eye showed fine vitreous haze. Disc margins and entire fundus were slightly blurred. There was a narrow scleral ring, the nerve being of good color. The capillaries were prominent. Vessels were normal, but the arteries were very small in comparison with the veins, so that the normal ratio was lost. In the retina, to the temporal side, there were a few yellowish white pin points producing a peculiar glistening retinal reflex, suggesting cholesterin deposits. The left eye agreed with the right, but cholesterin deposits were more numerous and this peculiar light reflex was much more prominent than in the other eye. Complete hospital tests showed only an essential hypertension. Without apparent change in the eyes the vision fell to 20/70 O.D. and 20/200 O.S.

Discussion. DR. DE SCHWEINITZ expressed the opinion, based however only on an opportunity for brief examination of the patient, that the lesions, namely a very fine so-called punctate hyalitis, distinct bilateral macular lesions, and a probable low grade chorioretinitis, suggested that the process was due to toxic influence not yet uncovered by the various examinations reported. Evidently a thorough search for a latent tuberculous focus, including an x-ray of the chest, was indicated, and he further advised colonic lavage, as intestinal sepsis might have been an etiologic factor.

Automobile injury of eyelids and orbit

DR. SIDNEY L. OLSHO (by invitation) reported the case of a man who had been thrown through an automobile windshield, receiving several lacerations of the face and of the circumorbital region. Later a triangular piece of glass was removed from over the malar bone. The foreign body was connected by a sinus with the conjunctival sac.

Quantitative pupillary light reflex

DR LOUIS LEHRFELD felt that the reaction of pupils to light depended so much on the source and amount of illumination that standard lights should be prescribed and the reaction noted in terms of plus one, two, three similarly to the notation of Wassermann reactions. In this way the progress of the lesion could be recorded. (See this Journal, vol. 11, p. 897.)

Orbital cellulitis simulating cavernous sinus thrombosis

DR. H. MAXWELL LANGDON reported a case of severe orbital cellulitis from infected nasal sinuses on the same side. There were severe constitutional symptoms. The intraocular veins were purple and dilated and a cavernous sinus thrombosis was feared. The condition improved with nasal treatment.

Discussion. DR. WM. ZENTMAYER said that only recently he had been asked to see a man who had rapidly developed a proptosis of the left eye with annoying diplopia. For lack of proper facilities, a complete study was impossible. There was marked limitation of all but the downward excursions of the eye, more particularly of outward rotation. There was no spontaneous pain, but this could be induced by backward pressure on the eyeball. The patient stated that for some time past he had been awakened many times at night because of a drainage of secretion into his throat. His doctor was advised to constrict the mucous membrane of the nose and introduce a tampon of argyrol and, as the condition was serious, to refer the patient to a rhinologist. It subsequently developed that the treatment was so efficacious that all the symptoms subsided in forty-eight hours and the patient had not yet been referred to the specialist. Reference was also made to a similar case seen some years ago in an infant in whom the same treatment resulted in an almost immediate subsidence of the symptoms.

DR. G. E. DE SCHWEINITZ exhibited a few lantern slides depicting unilateral orbital cellulitis from ethmoid disease, unilateral thrombosis of the cavernous sinus, and bilateral cavernous sinus thrombosis; the slides being made from illustrations in an excellent article by J. Julian Chisolm and S. S. Watkins entitled "Twelve cases of thrombosis of the cavernous sinus", and from a double orbital cellulitis due probably to an erysipelatous infection, from his own collection.

Dr. de Schweinitz called attention to the edema at the root of the nose and extending laterally in the sinus thrombosis patients, as compared with a similarly situated edema in orbital cellulitis cases, being in the former less defined and more diffuse than in the latter. The difference in the character and disposition between the two types of edema was rather noticeable, but whether it was a constant or even frequent condition he was unable to state.

He referred to Langworthy's statement that there was some evidence that in cavernous sinus disease there might be early diplopia due to paresis of the trochlear, but he had no experience of his own in support of this observation. Only too often the condition was too far advanced at the first examination to determine this point. Early anesthesia of the cornea was evident in cavernous sinus disease, usually, if not always, associated with slight haze of the cornea, which soon deepened.

DR. LANGDON, closing, said he thought that Dr. de Schweinitz' differentiation of the edema of cavernous sinus thrombosis and orbital cellulitis was very interesting, and it was borne out in this case, as the tissues around the bridge of the nose did not at any time lose their sharp outline and become boggy. When he saw the patient the motion of the eye was lost, and it was impossible to tell which nerve had been first involved.

The "triple light" as a practical method of perimetric illumination

DR. L. WALLER DEICHLER said that perimetry required ideal illumination, i.e., bright daylight, unclouded sky, and northern exposure. Comparative study of the perimetric fields in any given case or series of cases further required that these be taken under the same circumstances; i.e., at the same hour of the day, and with the same degree of illumination. The difficulty of attaining this was the reason for production of the "triple light". (See this Journal, vol. 11, p. 803.)

A case of occupational toxic amblyopia

DR WM. ZENTMAYER reported a case of toxic amblyopia in a man of forty-four years, a research worker in a large industrial plant. The family history was negative. Thorough clinical and laboratory study was negative except for a slight clouding of the ethmoids, but the direct examination showed no pathology. The patient had for years been exposed to an atmosphere well

laden with the fumes of benzol and methyl alcohol, and more recently had worked on a molding compound to which lead oxide was added. There was a typical retrobulbar atrophy with a paracentral absolute scotoma approximating fifteen degrees in diameter.

Inasmuch as it was only in his more recent work that lead oxide had been used, and since the visual disturbance seemed to date from this period, this might be the agent responsible for the amblyopia, especially as in the previous work others were equally exposed but unaffected, whereas in the latter work he alone was employed. This, however, was not conclusive, as in all toxic neuritides there was an individual susceptibility, and usually in lead amblyopia other well known symptoms involving the peripheral nerves were found, while in this case they were not present. The only conclusion possible was that the case was one of occupational amblyopia and that in view of the exposure to several agents of known toxicity to the optic nerve the causal one remained undetermined.

LEIGHTON F. APPLEMAN
Clerk.

COLORADO OPHTHALMOLOGICAL SOCIETY

April 21, 1928

DR. E. E. MCKEOWN presiding

Mature cataracts (self induced?) in dementia præcox

DR. JAMES M. SHIELDS reported the case of J. L., male aged twenty-eight years, who had for the past eight or nine years been a dementia præcox patient. He was examined first on June 20, 1927, at which time he constantly picked at his clothes and tapped with great force his knees, arms and face, using his index and second fingers. He seemed to give more of these blows to his eyes than to other parts. Examination showed a mature cataract of the right eye, with vision reduced to light projection. The left eye gave 6/5 vision with normal accommodation; normal pupillary reactions; clear media and normal eye ground. On November 25, 1927, the patient discovered he could not read with the left eye. Upon examination the left eye presented a massive hemorrhage into the vitreous. Since that time the left lens had become completely opaque and both irides showed the characteristic color resulting from degenerated blood pigment. Dr. Shields felt that both the cataracts had followed vitreous hemorrhages brought about by self-inflicted trauma. Both eyes now showed degeneration manifested by the changes in color in the irides and marked hypotension.

Thrombosis of superior retinal veins

DR. DAVID STRICKLER showed Mr. J. A. T., aged thirty-nine years, whom he had first examined on April 14, 1928. The patient had noticed blurred vision in the left eye three days ago. No pain nor other inconvenience was mentioned. The blurring was increasing steadily. The vision was 20/30 minus two letters. The fundus showed venous stasis in both superior retinal veins with numerous small hemorrhages throughout the upper half of the retina, and yellowish white areas between the hemorrhages. Veins were very large and tortuous. Upper half of disc was quite obscure and arteries were hard to see and harder to follow. The lower field was blurred with little invasion of the macula, though the hemorrhages approached the macula from above. Tension was twenty mm. Hg. in each eye. Wassermann and urine were negative. Blood pressure was 190/115. A later report states that the condition rapidly subsided so that by May 24, 1928, the hemorrhages had all disappeared, leaving the superior temporal vein tortuous, slight punctate changes near the macula, and small corkscrew vessels in the upper outer portion of the disc. The fields were normal. There was no scotoma but the blind spot was slightly extended to the temporal side. Vision with correction was 20/15.

Discussion. Dr. Melville Black thought the etiology of this type of case was more likely to be the result of abscessed teeth, sinus infection or syphilis. He would consider an albuminuric retinitis, but x-ray of sinuses and teeth and a provocative Wassermann should not be omitted.

Dr. William M. Bane believed the fundus picture was the result of embolus of the superior retinal veins.

Dr. George F. Libby and Dr. James M. Shields mentioned the evidences of sclerosis of the retinal vessels.

Rupture of sclera

Dr James M. Shields presented Mr. L. H., aged nineteen years, who had consulted him on April 10, 1928. The patient stated that while he was sitting beside the driver of a car which was going at rapid speed, a pheasant had struck the right side of the wind shield, shattered it, and hit the patient's left eye. The bird was stunned and had to be pushed from the lap of the patient. On examination there was a large rupture of the sclera between the inferior and lateral recti, and a large perforation of the conjunctiva, with vitreous presenting. The scleral rupture extended from within about four mm. of the limbus almost to the limit of the bulbar conjunctiva as it passed from the globe into the transitional fold. The eye was anesthetized and a conjunctival flap brought over the scleral wound. The conjunctival opening was closed with four interrupted sutures. The patient was put to bed and kept quiet for a number of days; atropin was instilled regularly. On the third day a marked plastic iridocyclitis was present. Six c.c. of sterile milk was injected into the buttocks for three consecutive days. The eye made an uneventful recovery, with no retinal detachment and no vitreous opacities. Vision at the present time was 20/24 with +1.25 sphere combined with —0.25 cylinder axis 65°. The uninjured eye gave standard vision without a lens.

Donald H. O'Rourke,
Secretary.

MEMPHIS SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

September 11, 1928

Dr. S. S. Evans presiding

Cyst of the iris

Dr. James B. Stanford presented Mr. F. I. G., an employee of the Frisco Railway, who had a large cyst of the iris. The right eye had been injured by a piece of hot iron on July 10, 1916, and gave some trouble for two months, after which time the vision was somewhat reduced but the eye was quiet. Six or eight months ago, the vision began to fail and "pupil began to close up." Dr. J. E. Jennings of Saint Louis at that time reported that the upper part of the iris was atrophic down to the pigment layer, that there was a white patch of exudate running down and in from the optic disc, and that an x-ray picture was made to see if there was a foreign body embedded in the white patch but revealed none. Today there was a large cyst of the upper part of the iris, divided into three compartments by thin partitions. A small slit of pupil was seen below the cyst. Through the pupil the fundus might be seen. The eyeground was apparently normal except for an area of choroidal atrophy down and in from the disc.

Discussion. Dr. R. O. Rychener had treated by iridectomy three cases of cyst of the iris, the largest two-thirds the size of the present one. All had done well. He had heard advocated aspiration of the encysted fluid through a fine needle and introduction of a drop of phenol to cause obliteration of the cavity. In case Dr. Stanford thought too much of the iris was involved for iridectomy, be suggested some such procedure.

Dr. Stanford would not consider injecting phenol into a seeing eye. He thought he would attempt a keratome incision with reduction of the cyst and removal of all involved iris.

Coloboma of the macula

DR. P. M. LEWIS presented a male patient who showed a coloboma of the macular region about twice the size of the disc. The area was practically round and markedly depressed. The nasal border of the coloboma was very definite and regular, giving it a punched out appearance. The temporal and lower margins were irregular and covered with black pigment. Pigment proliferations covered about a half of the colobomatous area. The remainder showed bare white sclera with a few retinal blood vessels running vertically across it. The papilla showed distinct atrophy of the temporal border. The peripheral field of vision was normal both for form and color. A large absolute central scotoma corresponded to the colobomatous area. Vision was O.D. 20/100, eccentric, O.S. 20/20. Refraction showed two diopters of hypermetropia with five diopters of astigmatism at ninety degrees in both eyes. No other defects of any kind could be found in this patient.

Keratitis, iritis, secondary glaucoma, probably due to intraocular foreign body

DR. M. B. SELIGSTEIN presented Mr. W. P. P., aged sixty years, whose chief complaint was that the right eye had been inflamed for the past month, and that he had a blur before it.

Examination of the right eye showed pericorneal injection, linear opacities in the cornea from above downward, and general cloudiness of the cornea. Tension with fingers was normal. The pupil was irregularly dilated from atropine, with no dilatation from the five to the seven o'clock position. The eye had not shown the least bit of improvement after three months treatment.

Discussion. DR. D. H. ANTHONY had refracted the patient previously, finding no special trouble with the right eye and the vision the same in each eye. He saw for the first time this evening a dark area on the iris which looked like an encysted foreign body.

DR. J. B. STANFORD thought that the diagnosis should be confirmed by x-ray, but there was present on the iris at the ten o'clock position a pin-head-sized brown object which looked like a foreign body. He thought the corneal disturbance was a keratitis bullosa and that a secondary glaucoma accompanied it. The patient gave a history of intraocular foreign body in 1898.

Dendritic keratitis

DR. M. B. SELIGSTEIN presented Mrs. K. M., aged forty-two years, first seen September 5, 1928, complaining of a feeling of dust or powder in the left eye, with very little pain. She had had chills and fever ever since childhood, but it had been ten years since she had had her last attack. She had had a somewhat similar attack with her right eye six years ago, which followed influenza. On August 29, 1928, she had a chill, followed in five days by a feeling of dust in the left eye. Since then, she had taken quinine and a chill tonic at irregular intervals. Examination showed marked pericorneal injection. At the two o'clock position on the cornea there was a gray infiltrated figure which had the shape of a perfect capital M. The fundus was normal. She was referred to her family physician for treatment. Smear for malaria was negative. She had been put on quinine at regular intervals. Atropine one per cent was used daily and dionin five per cent twice daily.

Discussion. DR. J. B. STANFORD stated that textbooks led one to believe dendritic keratitis to be a disease of adults, but that this was incorrect as the disease also occurred in children. He thought that it accompanied malaria often enough to be termed malarial keratitis.

DR. A. E. GILL inquired whether this form of ulcer occurred in any special type of malaria, and what the best form of treatment was.

DR. D. H. ANTHONY spoke of the chronic course of this disease and said that the patients rarely became well as rapidly as they thought they ought. He always watched carefully for signs of vascularization of the cornea, and when these were present he thought that the prognosis for cure should be good. He thought local treatment of

little value except to keep out secondary infection.

Dr. P. M. Lewis had treated many cases without malaria which recovered under local treatment only.

Dr. M. B. Seligstein remarked that the patient was taking a chill tonic in spite of the negative malarial smear.

Dr. R. O. Rychener,
Secretary.

KANSAS CITY EYE, EAR, NOSE, AND THROAT SOCIETY

September 21, 1928

Dr. T. S. Blakesley, presiding

Observation on cataract operations

Dr. E. E. Pickens said that since many patients who presented themselves for cataract operation were mentally as well as physically senile, and greatly in fear of hospitals, the mental preoperative preparation was of great importance, The same hospital and assistant should always be used in order to obtain good team work. In the larger hospitals the afternoon was the best time for operation, as there was less stir and confusion at that time. When possible the patient should be operated on in his own bed in the operating room, thus preventing confusion and squeezing of lids during transfer from table to cart and bed. The speaker recommended cocaine four per cent with injection of two per cent novocaine above the upper limbus for anesthesia. The injection was especially valuable in raising a bleb, so that a better flap could be procured. Sodium salicylate was given before and after operation, as the author found that postoperative irritation was much lessened thereby.

Discussion. Dr. Curdy advised bromides or 1.5 grains of luminal the evening before, with the same dose one hour before operation. Morphine was not generally used because it occasionally caused postoperative nausea and vomiting. The subconjunctival injection was made to either side of the cornea rather than at the top, as anatomical relations were then not disturbed in the line of incision. Novocaine injection in the lid was not used. Loss of vitreous was the greatest complication and might be greatly lessened by doing a capsulotomy operation. Smith's technique was advised for complicated cataract, a broad spatula being used to prevent loss of vitreous.

M. H. Clark,
Reporter.

LOS ANGELES COUNTY MEDICAL SOCIETY

Eye and Ear Section

October, 1928

Dr. Bertram Davies, president

Retinitis proliferans

Dr. Levengood presented a young man first seen by him in July. In May the patient had suffered a sudden loss of vision in both eyes. The ophthalmoscope showed a severe hemorrhagic retinitis which was more marked in the right eye. The Wassermann was negative and the only focus of infection found was an unerupted third molar which was removed. After the empirical use of antisyphilitic treatment the left eye returned to normal, but within the past month new hemorrhages had occurred. There was a beginning proliferative retinitis in the right eye.

Penetrating foreign body

Dr. William Boyce gave the report and x-ray pictures of a boy who had had a piece of lead 6 by 6 by 4 mm. penetrate through the limbus into the vitreous. With Dr. George McCoy he made an attempt to extract the foreign body through a scleral incision but was unsuccessful. The eye had to be enucleated. Dr. Boyce called attention to the difficulty of seizing with the forceps even so large a foreign body as this when it was in the vitreous.

Quantitative perimetry

Dr. Clifford Walker told of the history of the tangent screen and how

its use had been neglected since its origination. He explained that in order to get the most information from perimetry one must be able to use test discs covering a visual angle of from 1.7 minutes to several degrees. In order to use these smaller test objects, one should have a working distance of from one to four meters. He demonstrated his own design of screen, which was made of black felt. Marks were made upon the screen with wax crayons and removed with "carbona," or black and white headed pins were used. In order to get away from complicated mathematics he used the length of the arc of the circle in plotting his concentric rings, rather than the distance worked out upon the basis of the tangent of the angle used. The anatomy of the fiber bundles supplying the retina was discussed, and the theory was advanced that the crossed fibers from the upper and lower poles were most easily damaged because of their crossed nature. This would explain the development of the scotoma of Bjerrum. By the use of discs of small visual angles it was shown that areas of depression in the visual fields could be demonstrated when they were not obtainable in any other way. Thus, early lesions might be found which would be unnoticed on the ordinary perimeter.

Fields in toxic amblyopia

Dr. William Boyce discussed the field findings in tobacco, alcohol, and lead amblyopia, as well as those in retrobulbar neuritis and sinus disease. The principal feature to be expected was a central scotoma, particularly for red. He showed diagrams of typical fields in the above conditions.

Visual fields in glaucoma

Dr. A. Ray Irvine stated that in acute glaucoma perimetry was of little value. In chronic glaucoma the only field necessary was the white field, as it was affected coincidentally and equally with the color fields. He described the scotomata of Bjerrum and Seidel as the very early signs, and then the later contraction of the nasal field. The prognosis and treatment were best regulated by observation of the progress of field changes.

Both Dr. Irvine and Dr. Boyce expressed their satisfaction with the screen described by Dr. Walker.

M. F. Weymann,
Clerk.

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Authors' proofs should be corrected and returned within forty-eight hours **to the editor.** Twenty-five **reprints** of each article will be supplied to the author without charge. Additional reprints may be obtained from the printer, the George Banta Publishing Company, 450-458 Ahnaip Street, Menasha, Wisconsin, if ordered at the time proofs are returned. But **reprints to contain colored plates must be ordered when the article is accepted.**

TRAINING FOR OPHTHALMIC PRACTICE

Specialists, once regarded by the medical profession with disfavor, are now accepted and looked up to as capable of giving the best in their particular fields; and are even awarded the highest honors in the gift of the profession. Yet little more provision is now made for the training of the specialist than in the days when anyone making special preparation to deal with a particular class of diseases was set down as headed toward quackery.

The faculties of medical colleges and universities may have recognized their own unfitness to deal with such a problem as the education of a specialist in ophthalmology. The "postgraduate" medical schools have probably held a belief that their own continued, independent existence was the most important problem they could deal with. Certain it is that little more provision has been made for the systematic training of competent specialists in ophthalmic medicine and surgery than was available when everyone who would confine his practice to such a narrow field of medicine was considered unfit for the profession.

It has been agreed by eminent teachers of ophthalmology, such men as de Schweinitz and Parker in this country, and Barrett in Australia, that the special training for ophthalmic practice can not be given in the general undergraduate course on medicine. The best of medical students has then no time to prepare himself for special ophthalmic practice. To attempt to give him such training would waste the time of the student who took it; and would disorganize the presentation of what should be given to all who are preparing for any department of medical practice. The acceptance of specialization, and the enormous increase in the knowledge of all that pertains to medicine, have forced the conviction that anyone who would succeed in medical practice must keep on studying after he leaves the medical school; and the time to get special training in ophthalmology is after graduation from the general medical course.

The general medical course should be taken by all who wish to treat the defects, diseases, and injuries of the eye. The eye is a part of the body, and lives, keeps health, and performs its function through its connection with other parts of the body; suffers injury and disease from similar causes; and depends for restoration on the same vital processes. The attempt to create a profession of optometry, apart from medicine, has been as much a failure as attempts to manage diseases of the eye without any knowledge of its special function. But to attempt to split off a small part of medicine and combine it with optical knowledge, to furnish cheap treatment for eye conditions, is certain to fail of any good service to the public. Ophthalmic practice is a department of the general healing art; and will always be best carried on by those who have secured a fundamental education in general medicine.

But an understanding of only the principles of medicine will not fit one to practice any branch of the healing art as that art is now developed and made serviceable in all its special branches. As the greatness of medicine comes to be better understood, there will be careful selection of subjects and of the clinical training to be crowded into the four years undergraduate course. But this will only emphasize the importance of the special knowledge and training that must be gained afterward.

What are the things that every one hoping to become competent for ophthalmic practice should undertake to learn? Mathematics and optics are essential for an understanding of visual function and visual defects. They are not taught in the medical schools, are not needed in most branches of medicine. They might be learned in a premedical course, but would never be required for entrance to a general medical school. Most graduates in medicine know little about trigonometry or optics, yet these are necessary for a good understanding of the optical adjustments and defects of the eye. In beginning to study ophthalmology as a specialty, the physician should go back to these fundamental studies, should go outside of the medical institution, and, by the help of the scientific department of a college, or of teachers of mathematics and physics in the high school, should lay a foundation for the scientific understanding of vision, its defects and their correction.

Physiology and anatomy are taught in every medical school; but they are not taught from the point of view, or to meet the needs, of the ophthalmic physician or surgeon. When the medical graduate would prepare himself for ophthalmic practice he must go back to these fundamental medical branches, and study some things about them that the professors of physiology and anatomy never thought of teaching their classes. Every medical student learns where the eye is in the head and the names of the parts around it. But he does not learn the depth of the anterior chamber or how far it extends behind the sclera, and these are things he should know before he operates on an eye for cataract or glaucoma. He has heard, in a general way, that light entering through the pupil is focused on the retina. But he has never heard of the imperfections of this focusing, of the harm they do, or how the focusing is affected by changes in the size of the pupil; yet those factors raise practical questions that must be considered every day in ophthalmic practice.

Preparation for ophthalmology must go back to the study of facts of anatomy and physiology which are ordinarily as little known to the graduate in medicine as they are to the graduate in law or theology. Much the same is true of the pathology needed for special practice as compared with the general outline of pathology taught to medical students. Nowhere else do we find so many different tissues, closely packed together and functionally interrelated, as in the eye. Nowhere does proximity of differing tissues play so large a part in the damage that disease may produce. The course and effects of lesions are influenced by confinement without the rigid corneoscleral coat. So different are injuries done by disease in the eye from those due to the same disease in other parts of the

body, that the expert in general pathology may quite fail to appreciate the significance of what he finds in a diseased eye.

The refinements of ocular diagnosis require the mastery of new methods and instruments that the worker in other branches of medicine does not study or attempt to apply. To the therapeutic methods and resources which are shared by most branches of medicine must be added some that are scarcely used except in the treatment of the eye. The manipulations of the eye, both diagnostic and therapeutic, should be well understood and familiar before the young physician announces himself as engaging in special practice. The formal operations, which make ophthalmic surgery the most elegant and highly refined branch of surgery, should be carefully studied as a part of this preparation; although their mastery will require years of daily thought and manual practice.

The serious pursuit of a curriculum laid out on the lines above suggested will require a year of full time devotion on the part of the student. Added to the full time medical course and an interne year, this may be as much time as can be expected to be given to academic training; although one or more years of practical work under supervision might be added for those who seek a degree. The importance of adequate training for special practice should be understood by every ophthalmologist, who will thus be fitted to advise the young medical graduate how best to prepare for his life work. The provision for such training should be made by every medical college that can keep up graduate teaching, while the discussion of subjects and methods of such training may well command the attention of ophthalmological societies and space in ophthalmic journals.

E. J.

THE ARMY MEDICAL MUSEUM

In 1921, an agreement was entered into by the American Academy of Ophthalmology and Otolaryngology and the Army Medical Museum for the mutual benefit of each institution. The latter is essentially the pathological department of the United States Army, and as such received but little ophthalmic material. Therefore the Museum, with the consent and active cooperation of the Surgeon General of the Army, agreed to receive all ophthalmic pathological material sent to it, section the material, have it studied and diagnosed, and return to the donor of the material a report of the findings with diagnosis, together with a mounted section. This was to be entirely without cost to the original donor of the material, provided an adequate clinical history was included. The advantages to the donor were obvious; while on the other hand the Museum gained material that it could not hope to obtain from the Army. The work progressed so satisfactorily that soon the American Ophthalmological Society and the Section on Ophthalmology of the American Medical Association joined forces and assisted. How the ophthalmologists of the country have taken advantage of the situation may be gleaned from the following statistics that were presented at the meeting of the Academy this past October:

Eye specimens received and reported

1921	23
1922	129
1923	83
1924	161
1925	136
1926	105
1927	163
1928*	118
Total	918

Eye specimens diagnosed when received	*Other items: illustrations, models, etc.*	*Total*
..	23	46
11	679	819
95	73	251
4	256	421
191	4	331
..	..	105
282	89	534
46	3	167
629	1127	2674

* Up to September 1, 1928.

All of the material sectioned is first studied at the Army Medical Museum

and then sent to one of the members of the committee, appointed jointly by the three national ophthalmic societies to cooperate in the work. It is finally passed upon by Dr. Verhoeff of Boston, to whom belongs much of the credit for the successful carrying-on.

At the annual meeting of each of the three national ophthalmic societies above mentioned, the Army Medical Museum sends an exhibit showing the most interesting material that has been received during the past year. These exhibits invariably arouse a great deal of interest. There is now being prepared a series of one hundred sections, each fully described and diagnosed, that are to be available to any oculist belonging to any one of the three societies. These will be loaned for a period of two months without charge for the purpose of home study, the only stipulation being a small deposit to cover breakage or failure to return within the agreed time. This work is being financed by the Academy and will play a great rôle in the future.)

The service offered by the Army Medical Museum is not for the man with a laboratory at his disposal; but it is of great value to the average practicing ophthalmologist, who is not thus favorably situated. If only one quarter of the material all over the country that now goes into the incinerator were sent to the Museum, there would soon result a national museum of ophthalmic pathology unrivalled elsewhere. The material is not hidden away, to be dug out only by dusty search, but is on constant display and is always available. So please consider this as a plea to you, Doctor Reader, to send your interesting material to the Army Medical Museum, Washington, D.C., in order that you may receive a description and diagnosis of it and at the same time enrich a worthy project.† *Harry S. Gradle.*

†Specimens may be suitably packed by wrapping in cotton saturated with one to four per cent formalin solution, the whole being enclosed in a glass bottle safely corked.

OPHTHALMOLOGY IN RUSSIA

The World War, the collapse of the old régime, and the political disorder which followed were disastrous to Russian scientific medicine, ophthalmology included. The economic condition of the medical profession was extremely trying, the lack of instruments, drugs, and fundamental equipment was discouraging to the most optimistic—but worst of all was the complete scientific isolation. For years no word could be received from the outside world. "Vestnik Oftalmologii", a journal which during the last few decades had been a center of Russian ophthalmological thought, a source of information and inspiration, could not survive these conditions, and was discontinued in 1917.

Under these circumstances the end of civil war and the establishment of a central government, regardless of its political form, meant the beginning of a revival of Russian ophthalmology. Slowly scientific connections, first with western Europe, then with America, have been reestablished, and a valuable exchange of ideas and experience has resulted. In 1922 the monthly "Russian Ophthalmological Journal" was started by the ophthalmological societies of Russia, and shortly afterward the "Archives of Ophthalmology", which is issued at irregular intervals, was founded by the government. Both journals are edited by outstanding ophthalmologists, and their scientific contents are a credit to the profession.

Of the various problems which occupy the minds of our Russian colleagues, that of trachoma, a disease which is far from being eradicated in their country, remains in the foreground. It is enough to state that during the last year forty-nine articles dealing with the clinical, pathologic, immunologic, and social aspects of trachoma have been published.

A surprisingly large number of papers are devoted to ocular complications in such acute contagious diseases as typhus, recurrent fever, dysentery, and malaria. Evidently the tremendous epidemics which swept over Russia in the years

1917 to 1922 provided an abundance of material for the scientific worker in ophthalmology. Many contributions of lasting value, particularly in regard to recurrent fever, have thus been made.

Local infections of the eye—corneal, conjunctival, palpebral, and lacrimal—also attract a great deal of attention, probably on account of their prevalence. In a number of articles, Besredka's local immunization of the eye is discussed from both the theoretical and the practical point of view.

In surgery, plastic reconstruction of the eyelids and of the orbital socket occupies an important place—again an inheritance of eight years of war. Some new methods (for example, plastic repair based on a tubular pedicle) have been developed, and old procedures have been tried out on a large scale.

Glaucoma, as one would expect, dominates the field of research. Extensive laboratory work is being carried out to establish the mechanism which regulates intraocular pressure under normal and pathological conditions, and some remarkable results have been accomplished in experimental glaucoma. The problem is also approached from the clinical angle. While there are the inevitable "modifications" of surgical procedures for the treatment of glaucoma, there is also no lack of the valuable type of article which presents mature considerations on the use of established methods, surgical and nonsurgical, following prolonged studies of hundreds and even thousands of cases.

As a whole, ophthalmology in modern Russia, judged by the contents of the medical journals, on one hand reflects, in the predominance of contagious and neglected conditions, the grave economic and cultural situation existing in the country, and on the other hand proves not only the competence of Russian ophthalmologists to deal with manifold practical problems, but also their ability to contribute to the advance of our science.

M. Beigelman.

THE AMERICAN JOURNAL OF OPHTHALMOLOGY IN 1928

It is not often that the readers of the American Journal of Ophthalmology volunteer their criticism, favorable or adverse, of the medical pabulum which is being delivered to them month by month. In addition to those who, at national medical meetings, express friendly appreciation, perhaps a round half dozen, out of the total number of about two thousand subscribers, have gone out of their way to write entirely voluntary expressions of satisfaction.

Among equally rare examples of outspoken criticism, some have desired longer and weightier medical essays, and others a greater number of brief clinical contributions; one very faithful reader was shocked because the same medical essay, from two different journalistic sources, had been abstracted twice; and another wrote that he was not in sympathy with the news items department but would like to see the space used for other purposes.

While the efficiency of service rendered to their patients by the ophthalmic physicians of English-speaking North America is fully equal, and in one important respect may be claimed to be greatly superior, to the average throughout the rest of the civilized world, yet it must be admitted that, in proportion to the magnitude and general enlightenment of this area, the trend toward self-expression through medical literature is hardly so pronounced as might be expected or desired. It may be that professional men are so busy taking care of their patients that their "cacoethes scribendi" assumes a secondary position. North and south of the unarmed frontier, we are still a new people or congeries of peoples. As yet we are by no means a preponderatingly literary people: pioneer civilizations are not. Yet, outside of one or, at the most, two European countries, our production of medical literature of good quality will compare favorably with that of the rest of the civilized world.

In several of its features, in spite of

their shortcomings, the American Journal of Ophthalmology is attempting to cover ground that is hardly included within the purview of other ophthalmologic journals. The editorial section, to which Dr. Jackson still contributes so regularly, has often been the subject of favorable comment. In the society proceedings are found many interesting reports and discussions in regard to unusual cases or clinical experiences which would not be published in any other form. The editor gratefully acknowledges the very able service rendered by Dr. Lawrence T. Post in the conduct of this department, and in other ways. He is also much indebted to Dr. Melville Black for taking charge of the news items department.

The abstract department goes further than any other monthly ophthalmologic abstract department in the world, with one possible exception, toward furnishing an up-to-date, comprehensive guide to original articles on ophthalmology. Such a department would be altogether impracticable without the loyal and devoted help of a group of workers in various parts of the country. For the past year, these collaborators, without other remuneration than the pleasure of rendering a service, and, it need hardly be said, frequently at decided personal inconvenience, have displayed a commendable, even a touching willingness to do the work that they had offered to do, promptly and for the most part remarkably well. One indefatigable worker has furnished, including this issue, not far from two hundred abstracts from a foreign language.

It seems fitting here to list the names of those who have provided abstracts for this volume of the American Journal of Ophthalmology.

From journals in the English language: Drs. Eugene Blake, D. F. Harbridge, Edward Jackson, Donald H. O'Rourke, M. Hayward Post, and George H. Stine.

French: Drs. Lawrence T. Post, Jerome B. Thomas, and M. F. Weymann.

German: Drs. Francis H. Adler, David Alperin, Frederick C. Cordes. Beulah Cushman, M. L. Folk, F. H. Haessler, Harvey D. Lamb, and Charles Zimmermann.

Italian: Drs. Sanford R. Gifford, F. Park Lewis, and Solon L. Rhode.

Spanish: Drs. M. Beigelman and A. G. Wilde.

Scandinavian group: Dr. D. L. Tilderquist.

Russian and Polish: Dr. M. Beigelman.

It is hoped that the index to volume eleven of the American Journal of Ophthalmology, printed with this issue, will materially facilitate the use of our abstract department for reference purposes.

In the past year, several gentlemen, entirely unsolicited, have been kind enough to write offering their services for the abstract department. It is not always possible to assign work as soon as such an offer is received, but on account of occasional resignations, absence from the country, or illness it is always an advantage to have a reserve list of those who stand willing to help; and the editor will be glad at any time to hear from volunteers.

W. H. C.

FREE SPEECH IN ITALY

For many years an apparently loyal member of the Triple Alliance, Italy has in some respects reflected very strongly the stimulus and example of German civilization. That influence is clearly visible in the medical literature of this resurgent Latin people, as well as in the professional organization of its clinical institutions. Industry and research, in laboratory and clinic, are abundantly manifest in the periodical literature of Italian ophthalmology, and Italy's leading ophthalmologic journal is one of the world's best.

A few malicious critics have ventured to suggest that, while the Mussolini régime may be a shining success from the managerial point of view, yet freedom of speech among its people has been rather too vigorously curtailed. This limitation can hardly, of

course, be expected to apply to Italian comment upon what is said or done outside of that country. It is pleasing to find that the American Journal of Ophthalmology is given rather liberal attention in the Annali di Ottalmologia e Clinica Oculistica, of Rome, and Professor Speciale-Cirincione, of Turin, who ably abstracts many of the essays published in our Journal, often favors us with trenchant and even withering criticism.

In abstracting the description of an ingenious proposal for cataract extraction, Professor Speciale-Cirincione remarks: "It used to be the great cataract operators who suggested some modification, after having done the operation by the thousand; today every beginner feels himself in a position to throw light on the cataract operation, complicating that which is simple and confusing the minds of young oculists, who do not always succeed in distinguishing gold from tinsel."

In reviewing a recent excellent study of the embryology of the vertebrate retina, the amiable professor adds the final terse comment: "Nothing new!"

As to a report on a case of tuberculosis of the conjunctiva, reference to a colored drawing and a photograph which accompanied the report calls forth the remark: "Neither the one nor the other demonstrates anything."

Another author's suggestion that the superior and inferior recti are antagonists of the obliques is flatly contradicted.

A rather full abstract of a paper on protein injections in gonorrheal ophthalmia is followed by a criticism which is almost as long as the abstract, and which is particularly vigorous. All such attempts at new forms of treatment of this disease are condemned as distracting from the classical cure with silver nitrate. The Italian critic regards it as "an actual crime to claim that conjunctivitis can be cured by injections of milk, and hence to induce the inexperienced oculist to neglect swabbings with silver nitrate." The same condemnation is aimed at "attempts, also criminal, to cure ophthalmoblennorrhea with antitoxic substances (diphtheric, antigonococcic, etc.), and, above all, against the specifics which are current in therapy and the use of which should be prohibited by law."

Criticism is refreshing and often distinctly beneficial. Among several excellent reasons for studying the Italian language may be suggested the opportunity thus afforded to see ourselves as others see us, through the medium of Professor Speciale-Cirincione's generous verbal cautery. Future writers in the American Journal of Ophthalmology, beware! *W. H. C.*

BOOK NOTICES

Transactions of the College of Physicians of Philadelphia, vol. 49, 1927. Cloth. 378 pages, illustrated. Philadelphia, printed for the College.

This volume sustains the high reputation of the Transactions of this organization, widely known to the profession. The abstracts of the Proceedings of the Section on Ophthalmology occupy sixty pages. These have already been published in this Journal (v. 10, p. 538 to v. 11, p. 470). Also of special interest are the addresses made at the April meeting, in celebration of the centenary of the birth of Lord Lister, with a fine photographic portrait of that great surgeon. There is also a joint report on calcium studies in jaundice, with special reference to the effect of parathyroid extract; and as to its value in hemorrhage. An alphabetic index of ten pages renders accessible to the reader the contents of the volume, and makes it of permanent value as a book of reference. *E. J.*

Report of Eye Clinics, Session 1927-1928. Fox, L. Webster. Paper octavo, 68 pages. Philadelphia, Medical Searchlight Publication, July, 1928.

The doctors who crowd into eye clinics and peer over obstacles, to see

the shoulders and elbows and assistants of the operator, should have their attention called to these reports. Of the 290 cases here reported from the clinics of Professor Fox at the Graduate School of Medicine of the University of Pennsylvania, nine-tenths were operative. These cases, briefly reported and discussed, furnish excellent reading for any one interested in ophthalmic surgery who wishes to supplement his limited operative experience. They cover a wide range of conditions, with brief histories, statement of details of case characteristics, reasons for operating, technique employed, and follow-up histories of results. Their perusal will certainly tend to make the prospective operator approach his cases with caution, with serious consideration of what is involved in the work, and with a sense of responsibility in it. They will supply an excellent substitute for actual experience of the individual operator.

There is a sort of supplement—a report of slit-lamp clinics—which includes notes of fifty-eight cases examined by the methods of biomicroscopy. These also include a wide range of pathologic conditions, studied by this recent rival of the ophthalmoscope in the field of ophthalmic diagnosis. An alphabetic index of two three-column pages makes this pamphlet a convenient work of reference for the young practitioner in dealing with cases which present unfamiliar conditions. *E. J.*

The Eye. By C. W. Rutherford M.D., F.A.C.S. With 305 black and white figures and 12 original colored plates. D. Appleton and Company, New York and London, 1928.

It is some time since a new author brought out a textbook on the eye. This one is really welcome for the use of undergraduates, as it is couched in simple language and deals practically only with the commoner diseases, methods of treatment, and operations. It is addressed to the needs of the general practitioner and the student of medicine, and is therefore not a particularly essential accrement to the library of the expert.

To the reviewer's mind ophthalmological books intended for general practitioners are somewhat superfluous, for, at least in the larger cities, they have but little to do with the eye except for trivial conditions and in the course of general examination as relates to congestion, the condition of the pupil, and roughly the ocular movements. There are but very few general men who can even see the optic nerve with the ophthalmoscope, so they should in practically all instances refer their cases to an oculist when the eye is diseased, when sight is failing, and above all in most cases of disease of the nervous system, in syphilis, and in other grave constitutional conditions.

While some attention is given to the effects of general diseases and the relations of the eye to the nasal sinuses, these subjects might have been enlarged upon.

The book itself, beautifully printed, has many new, well done illustrations, and contains twelve colored plates of excellent quality. A very exhaustive index is appended.

H. V. W.

Società Italiana di Oftalmologia, Atti del Congresso d'Oftalmologia. (Proceedings of annual congress.) Rome, November 3-5, 1927. Paper covers, 448 pages, illustrated. Rome, L'Universale Tipografia Poliglotta, 1928.

This is a report of the proceedings of the Italian Ophthalmological Society at last year's annual congress. For the most part the discussions are reproduced in considerable detail. A number of the papers are of conspicuous merit, and the average quality reflects a high level of scientific attainment and enterprise. Some of the papers have already been published in medical periodicals, especially in the Annali di Ottalmologia e Clinica Oculistica. It is, however, a rule of the Società Italiana di Oftalmologia that the papers presented to its annual congress are the

property of the Society and can only be published elsewhere by permission of the executive committee of the Society.

Some features of the constitution of the Italian Ophthalmological Society, as published in this volume of transactions, may be of interest to the membership of similar organizations elsewhere. The Italian society consists of ordinary and corresponding members. The number of ordinary members is limited to one hundred, and they alone have power to vote. The number of corresponding members (active members of non-voting rank) is unlimited. The constitution can only be changed by an affirmative vote of at least four-fifths of the ordinary members (and only those members present are allowed to vote; so that the organization has a very conservative structure). Among the ordinary members there is a special class of founder ("fondatore") members. A "founder member" is an ordinary member who, in addition to the regular annual dues, contributes a further annual sum of not less than one thousand lire (approximately fifty dollars). The vote of each founder on any question is counted as two votes. Thus, much the greater part of the membership of the society is without a voice in its business affairs and in the election of members.

The proceedings of the 1927 meeting opened with a discussion of industrial compensation. Professor Pardo, of Genoa, emphasized the importance of taking into account, for the purposes of indemnity, other factors beside central visual accuity. He also recommended that the measurement of vision should be made in every case with the refractive correction so far as this could be practically tolerated; provided that a claimant whose accident rendered necessary the wearing of glasses which he would otherwise not require should be given a fixed additional indemnity of five per cent. Pardo's recommendations were approved by vote of the Society.

The Congress also adopted some very drastic resolutions in favor of requiring a year's institutional study for anyone desiring to conduct business as an optician; of prohibiting an optician from selling lenses to correct refractive errors except upon prescription of an oculist; and of prohibiting the practice of ophthalmology in opticians' shops ("this constituting illegal competition with other opticians"). *W. H. C.*

Ofthalmologicky Sbornik. Collection of papers read before the II. Congress of the **Czechoslovak Ophthalmological Society,** 1927. (English and French summaries attached.) Paper covers, 605 pages, illustrated. Published by the Czechoslovak Ophthalmological Society, Prague, Ceska ocni klinica.

This very neatly printed and illustrated volume contains thirty-two papers (in Czech) on a wide range of ophthalmologic subjects. Each paper is followed by a brief summary in either English or French. *W. H. C.*

Stereoskopische Bilder für schielende Kinder (Stereoscopic pictures for squinting children), by Professor Dr. C. H: Sattler, Königsberg. Forty-five double plates with explanatory text. Price, with linen case, 6.80 marks. 1928. Verlag von Ferdinand Enke in Stuttgart.

For diagnosis and development of binocular vision in young children, the author has been impressed with the inadequacy of the stereoscopic pictures commonly available in commerce; such pictures being for the most part uninteresting to young children and difficult for them to describe. Pictures specially prepared for young children have generally been open to the criticism that they serve merely for combination of the two images, not for perception of depth.

The simple zinc etchings in the present excellent series of stereoscopic pairs have been prepared with the help of an artist, Miss Burdach. The first two pairs do not serve any perspective purpose, but are merely for accurate determination of the proper distance at

which the pictures are to be viewed through the stereoscope, and also to learn whether both parts of the picture reach the child's consciousness equally well. The remaining forty-three pairs serve to determine whether a sense of depth is obtainable, and with two exceptions they are so designed that each half furnishes separately no sense of perspective, whereas with two halves an estimation of the relative distance of some object in the picture is called for. For example, in regard to a chair and the figure of a girl leaping through the air, the question asked is whether the girl is jumping over the chair or in front of or behind it.

Sattler's series is admirably designed and executed, and is calculated to serve splendidly the purpose for which it is intended. The publisher and author should arrange for a thoroughly idiomatic translation of the explanatory text into English, or for an English or American edition. *W. H. C.*

Giza Memorial Ophthalmic Laboratory, second annual report, 1927. (Ministry of the Interior, Egypt, Department of Public Health.) Misr Printing Press, Cairo, 1928.

This interesting institution was opened in September, 1925, as an extension of the work of the ophthalmic department of the Egyptian Ministry of Public Health. The Laboratory undertakes systematic postgraduate education of physicians in the Egyptian government service who are to devote themselves to ophthalmology in the government ophthalmic hospitals; and attention is also apparently given to the preparation of general medical students at the University (? at Cairo) for the special ophthalmic problems of Egypt. Further, the Laboratory examines specimens from the various ophthalmic hospitals throughout Egypt and from a small number of private clinics. A number of pathologic specimens of particular interest are described in this annual report, with some excellent illustrations.

A special study was made as to the value of painting the trachomatous conjunctiva with chaulmoogra oil. Beneficial results were obtained from simple painting and especially from vigorous rubbing of the palpebral conjunctiva with the oil. But the oil was not regarded as in any way a specific for trachoma.

Ten per cent of the people of Egypt are blind in one or both eyes, and the predominating cause of this blindness is gonococcic ophthalmia. Especial study was made as to the advantage of combining intramuscular injections of antigonococcic serum with the ordinary local silver treatment of this disease. The period of treatment was found to be shortened by the use of the serum, but the cost of the serum made it advisable to limit its employment to the more severe cases. Large doses (eight to ten c.c.) on successive days are recommended. *W. H. C.*

United Fruit Company, Medical Department, sixteenth annual report, 1927. Card covers, 368 pages, illustrated. General offices of the company, Boston, Massachusetts.

This volume is not, as one might expect, a mere drily statistical statement of work done in this great company's hospitals; but rather a collection of very valuable papers on various tropical diseases, together with a number of interesting case reports by medical officers of the company.

Two papers included, by special invitation, are by Sir Aldo Castellani and Dr. W. M. James, eminent research workers in the field of tropical diseases.

A special feature of the company's research work during the past year has dealt with the cure of human carriers of malaria, by means of a combination treatment with plasmochin and quinine. Plasmochin is a new drug particularly effective in clearing the peripheral blood of gametocytes, the adult sexual forms of malarial parasites that infect mosquitoes. This drug is said to be the most important discovery for malaria control since the value of quinine in the cure of malaria was first recognized; and considerable space is

devoted to discussion of its use by different methods and dosages.

W. H. C.

CORRESPONDENCE

Grassi's "De Oculis"

To the editor:

At the moment I am engaged in translating for publication, with introductory notes, Benevenuto Grassi's "De Oculis" etc., Ferrara, A.D. 1472. This is the first printed book on the eye and its diseases, a very rare Latin incunabulum of which only about twenty copies have survived the ravages of time. The monograph has never been translated into modern English, and it is now proposed to make it available to those who would like to read it in English.

Of the existing examples of this work two are in American libraries—one in the collection of the College of Physicians, Philadelphia, and the other in the Surgeon General's Library at Washington.

In the proposed publication it is intended not only to give a translation of the original Latin text but to describe briefly the various codices and printed versions of Grassi's famous treatise.

Although I am not aware of the existence on this side of the Atlantic of more than two copies of the Ferrara incunabulum, yet there may be others, and I write to ask if any of your readers know of additional examples. I shall be grateful for this information.

Casey A. Wood.

Stanford University,
California

ABSTRACT DEPARTMENT

Abstracts will be classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is only mentioned in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. General methods of diagnosis
2. Therapeutics and operations
3. Physiologic optics, refraction, and color vision
4. Ocular movements
5. Conjunctiva
6. Cornea and sclera
7. Uveal tract, sympathetic disease, and aqueous humor
8. Glaucoma and ocular tension
9. Crystalline lens
10. Retina and vitreous
11. Optic nerve and toxic amblyopias
12. Visual tracts and centers
13. Eyeball and orbit
14. Eyelids and lacrimal apparatus
15. Tumors
16. Injuries
17. Systemic diseases, including parasites
18. Hygiene, sociology, education and history

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1. GENERAL METHODS OF DIAGNOSIS

Arnold, Gottfried. **Simple method of exact measuring of exophthalmus.** Klin. M. f. Augenh., 1928, v. 80, May, p. 656.

Hertel's exophthalmometer does not give accurate results in slight degrees of exophthalmus, on account of the frequent asymmetry of the temporal orbital margins, which serve as starting points. Arnold recommends instead of this the keratometer of Wessely, with which the starting point is the bridge of the nose, on which the intersection of the fixating line of the healthy eye with the bridge of the nose is marked with lead pencil. Then the distance of each corneal vertex from this plane is ascertained with the keratometer. The difference of these distances indicates the exact amount of exophthalmus.

C. Zimmermann.

Holth, S. **The comparative three object rule, with bright red and rose in colored celluloid, and with yellow and blue in sealing wax, for central color scotoma—also in congenital anomaly of color sense.** Norsk Mag. f. Laegevid., 1928, September, p. 898.

See abstract from the British Journal of Ophthalmology, A. J. O., 1928, v. 11, September, p. 746.

Kohler, A., and Tobgy, A. **Microscopic examination of ocular media with ultraviolet and polarized light.** Arch. f. Augenh., 1928, v. 99, July, p. 263.

Kohler and Tobgy give their technique for photographing eye structures with ultraviolet and polarized light. The article contains sixty-one excellent photomicrographs.

Frederick C. Cordes.

Pavia Lijo. **Concerning interference with the foveal reflex.** Rev. Oto-Neuro-Oft., 1928, v. 3, July, p. 299.

The author discusses the reflexes seen in and around the macular region when it is viewed in red-free light through the widely dilated pupil. Slight exudates in the macular region are not visible to the ordinary forms of illumination or examination. When the red-free light is employed, two reflexions are found in the normal macula, one in the center of the fovea, round and clear cut, produced by the bottom of the concavity; the other at the edge, where it shows as a distinct ring. Any form of exudate, however slight, interferes with these normal appearances, altering their number or outlines in accordance with the amount of the local disturbance present.

The subject is further elaborated by

means of stereoscopic photographs, and explanations regarding the cases from which they were taken.

A. G. Wilde.

2. THERAPEUTICS AND OPERATIONS

Angelucci, A. **Autohemotherapy and iontophoresis in ophthalmology.** Arch. di Ottal., 1926, v. 33, Oct., pp. 439-463.

In trachoma the author uses parenteral injections of five to ten c.c. whole blood with one-half to one c.c. of serum given subconjunctivally. He reports good results, especially in cases with corneal complications. In incipient cataract he claims results from iontophoresis with an iodide solution.

S. R. Gifford.

Blatt, Nicholas. **Interference in ocular diseases.** Graefe's Arch., 1928, v. 120, p. 335.

As examples of the well-known beneficial action of intercurrent disease, the author gives in brief the history of a number of his cases with primary ophthalmic disease affected favorably by other disorders. In three cases of parenchymatous keratitis, one was much improved by an attack of scarlet fever, another by diphtheria, and a third through angina and tonsilitis. An attack of phlegmon of the eyelids apparently cured a case of long-standing chronic catarrhal conjunctivitis, the onset of acute purulent conjunctivitis cured another, and influenza a third case of chronic catarrhal conjunctivitis. An attack of scarlet fever stopped the activity of a herpes corneæ, anthrax that of an ulcerative blepharitis, and gonorrheal corneal ulcer that of a syphilitic uveitis. Among seventeen cases of tabetic optic atrophy treated with malaria, according to Wagner-Jauregg, in four the process was checked and the vision brought to a standstill.

H. D. Lamb.

Braunstein, N. **Treatment of eye diseases by means of ultraviolet rays.** Zeit. f. Augenh., 1928, v. 65, July, p. 232.

A brief report of treatment of nineteen cases of ulcus serpens, eleven of tuberculosis, fifteen of phlyctenular conjunctivitis, six of herpes corneæ and four of old corneal opacities. In all these classes of case the author notes striking improvement as a result of this form of treatment, which is neither dangerous nor difficult.

F. H. Haessler.

Davids, H. **X-ray treatment in experimental tuberculosis of the anterior portion of the eye.** Arch. f. Augenh., 1928, v. 99, July, p. 331.

Davids produced bilateral ocular tuberculosis in fifteen rabbits. In each animal, one eye was treated by varying doses of x-ray. He found that in the great majority of cases the treated eye presented a more favorable picture; this in spite of the fact that the worse eye was always chosen for the therapy. In applying this method of treatment to a small series of patients, the results were not startling, but at least rather favorable. He feels sufficiently encouraged to continue the work in human ocular tuberculosis. The local eye treatment must also be carried on.

Frederick C. Cordes.

Demaria, E. B. **Treatment of tuberculous lesions of the eye with minute doses of tuberculin.** Arch. de Oft. de Buenos Aires, Aug., 1928, v. 3, p. 539.

The author reviews the various applications of tuberculin, from Koch up to the present, along with theoretical conceptions upon which changes in the original technique are based. The method he employs at present was instituted by Viton of Buenos Aires, and was presented during 1923 in a book entitled "Tuberculin therapy." The minutest doses of tuberculin are recommended both for diagnostic and therapeutic purposes.

A general résumé of the Viton method of employing tuberculin in contrast with that of Koch is distinctly in favor of the former as to the patient's general condition. The Viton technique uses four strengths

in which the tuberculin is diluted with physiological saline solution up to a strength of one part to 9, 10, 11, and 12 zeroes respectively. Where the patient is very susceptible to its effects, this is carried still farther, even up to twenty-five zeroes.

A. G. Wilde.

Elkes, C. **Besredka's bacteria-free filtrates and their therapeutic use in diseases of the eye.** Zeit. f. Augenh., 1928, v. 65, June, p. 135.

If ten-day broth cultures of staphylococcus are filtered and sterilized by heat, one contains a culture medium in which other organisms grow freely but in which staphylococcus grows poorly or not at all. To explain this an antivirus, thermostable in contrast to the thermolability of the virus, is postulated, by analogy with antiferments which develop in certain cells, as for instance leucocytes. In a small series of cases—hordeolum, chronic dacryocystitis, conjunctivitis—rapid healing followed repeated application of antivirus to the mucous membrane of the conjunctival or lacrimal sac.

F. H. Haessler.

Goebel. **Fixation of the eyeball.** Klin. M. f. Augenh., 1928, v. 80, June, p. 813.

For safe and easy fixation of the eyeball the fixating instrument must be totally placed in the sclera. Goebel has devised, and illustrates, a forceps with hooks like fine discission needles of two millimeters length.

C. Zimmermann.

Koch, J., and Widmark, E., **Absorption of ultraviolet rays in new varieties of glass.** Hygiea, May 31, 1928, v. 90, p. 414.

A spectroscopic study was made with common glass in comparison with three new glasses, Vita glass, Ultra glass, and Bios, as to the comparative absorption of the ultraviolet part of the spectrum. It is known that common glass transmits almost no ultraviolet rays, while it is claimed for these new glasses that they transmit a great part of these rays. A quartz mercury lamp was used as a source of light in the experiments. It was found that the claims for the new glasses were sustained, in that they transmitted the greater part of the ultraviolet rays; some wave lengths (e.g., 3,000 Å.E.), in the thickness of glass experimented upon, passed through up to seventy per cent. Unfortunately, however, the efficiency of the glasses diminished very rapidly on exposure. For instance, violet light of wave length 2,805 Å.E. penetrated the Vita glass during the first ten seconds to the amount of 17.1 per cent; but, after less than an hour's exposure, the penetration had fallen to three per cent. These glasses, therefore, cannot be used to advantage for globes for lamps from which the ultraviolet rays are desired, unless this objection can be overcome.

D. L. Tilderquist.

Poos, F., and Santon, G. **The action of ergotamine on the eye.** Ann. di Ottal., 1928, v. 56, Sept., pp. 769-778.

Gynergen or ergotamine (gynergen), a derivative of ergot, whose subcutaneous or intramuscular use has been shown to cause a fall in intraocular tension, has been considered to produce its effect by paralyzing the sympathetic nerve endings. The present authors offer evidence that its action is not so simple. No miosis was ever produced in animals by its use. On the contrary, it produced dilatation of the pupil in rabbits, and the same effect was noticed when the sympathetic was extirpated. When used with adrenalin or cocain, its effect on intraocular tension was increased. These effects point to its action by stimulation of the sympathetic nerve endings. Other effects, such as spasms of accommodation, indicate stimulation also of the parasympathetic. The unquestioned fact that it does not reduce intraocular tension can hardly be explained by our present knowledge.

S. R. Gifford.

Tsykulenko, K. J. **Omitting the eyedressing in postoperative care.** Russkii Opht. Jour., 1928, Aug., pp. 263-266.

The author is in favor of the "open" treatment of operative cases. In sixty-seven cases of intraocular operation, of which twenty-eight were cataract extractions, dressings were completely omitted in the postoperative period. A wire mask similar to Fuchs's was used for the protection of the operated eye. No ill results followed.

M. Beigelman.

Volkmann, Günther. **Treatment of ocular diseases with a new nonspecific fever-producing substance (pyrifer).** Zeit. f. Augenh, 1928, v. 65, May, p. 10.

Pyrifer consists of protein from a nonpathogenic bacterium, and was first proposed as a harmless substitute for malaria treatment of parasyphilis. The author used it in acute infections of the cornea and uvea, in injuries, and in two cases of syphilis and parasyphilis of the eye.

He found it effective in cases where milk was effective, namely in fresh inflammatory lesions, and it was sometimes effective after milk reaction had become exhausted. The reaction was severer and more unpleasant than after milk. The remedy was not tried in gonorrheal infections.

F. H. Haessler.

3. PHYSIOLOGIC OPTICS, REFRACTION, AND COLOR VISION

Bordier, H. **"Water lines" ("moiré") are the result of an imperfection of our visual acuity.** Arch. d'Opht., 1928, v. 45, Aug., p. 515.

Moiré is described as the phenomenon of the appearance of waves in cloth, especially silk and other materials, caused by the arrangement of the fibers in their construction. It is shown that if two gratings of parallel lines are superimposed and one is slightly rotated, so that the lines cross at acute angles, the same appearance of waves is produced. If two single lines are crossed at an acute angle and held before a window, there is a shadow in the apex of the angle. This shadow is described as being due to circles of diffusion present in the human eye. If human vision were perfect, the apex of the small angle would be distinctly seen. The conclusion is drawn that if visual acuity were perfect the moiré phenomenon would not exist.

M. F. Weymann.

Cowan, Alfred. **Point focal lenses.** Guildcraft, 1927, v. 1, Sept., p. 19.

This is an address delivered before the Guild of Prescription Opticians of America, dealing with the characteristics of some of the improved meniscus lenses that have been put out of late years under copyrighted names and patent restrictions. When a pencil of rays passes obliquely through a spherical lens, it emerges as an astigmatic pencil, the astigmatism increasing with the degree of obliquity. For spectacle lenses the astigmatism of pencils of rays that fall near the margin of the lens is the only form of aberration serious enough to warrant special attention. By convex and concave surfaces carefully proportioned to the strength of the lens, to its distance from the eye, and to the distance of the object this astigmatism can be reduced to a minimum; although for spherocylindrical lenses this can be done for only one of the principal meridians. Calculations have been made to determine the best form for each strength of lens, and these forms are used in making certain lenses, widely advertised as ideal in form.

"These lenses are made from secret or patented formulæ, and for scientific-minded persons there is no more excuse for patent lenses than there is for patent medicines. As a matter of fact no one lens can be made to correct the astigmatism due to obliquity for every eye, for every distance of the object, and for every meridian of a cylinder."

Cowan measured the powers of a series of two widely advertised forms of such lenses, ranging from —6. to

+6. D. The back surfaces of the positive lenses varied in one form between —6.62 and —7.87 diopters; and in the other form between —5.12 and —6.37. Testing the astigmatism of pencils falling obliquely on various lenses, Cowan concludes that the astigmatism caused by an ordinary lens with an inside curve of —6. D. may be considered as negligible.

He suggests the following series of forms, which can be ground in any thoroughly equipped optical shop, and each of which would answer the practical requirements of a point-focal lens:

Diopters	Front surface	Back surface
Convex		
1	+ 7	— 6
2	+ 8	— 6
3	+ 9	— 6
4	+ 10	— 6
5	+ 11	— 6
6	+ 12	— 6
7	+ 13	— 6
8	+ 14	— 6
9	+ 14	— 5
10	+ 14	— 4
11	+ 14	— 3
12	+ 14	— 2
13	+ 14	— 1
14	+ 14	plano
Concave		
1	+ 5	— 6
2	+ 4	— 6
3	+ 3	— 6
4	+ 2	— 6
5	+ 1	— 6
6	plano	— 6

E. J.

Daniels, Berthold. **Range of accommodation in the alcoholic.** Zeit. f. Augenh,. 1927, v. 62, July, p. 288.

The author experimented with a number of alcoholics in the post-delirium tremens stage or after excessive use of alcohol, and found that such patients had a reduction of fifteen per cent in the range of accommodation, although no ophthalmoplegia interne could be made out.

David Alperin.

Lindner, K. A. **A contribution to the correction of astigmatism.** Zeit. f. Augenh., 1927, v. 62, July, p. 210.

The author seeks to explain the common experience that full correction of the astigmatic error as ordinarily determined is not always tolerated, and that gradual increase of the cylinder strength may often be resorted to with advantage. The article is somewhat discursive and can not be satisfactorily abstracted. *David Alperin.*

Michelatti, V. **Relation between skiascopic values obtained by examination over the nerve and over the macula.** Ann. di Ottal., 1928, v. 56, Sept., pp. 817-829.

Sixty-eight myopic eyes were examined, and all showed a difference in refraction averaging two diopters between the two regions. The region of the nerve was always the more myopic, and this, the author considers, must be due to a greater length of the optical axis at this point. The difference was not proportional to the degree of myopia, some eyes with only moderate myopia showing a difference of two to two and a half diopters. *S. R. Gifford*

Scalzitti. **Persistent hyaloid tract studied by the slit-lamp.** Ann. di Ottal., 1928, v. 56, Jan., p. 84.

The slit-lamp has clarified some disputed points in regard to the persistence of the hyaloid tract through the vitreous. The ultramicroscope has shown that in the child the hyaloid canal has no distinctive walls but that the canal is formed from the filaments of the vitreous body enveloping the artery that passes between them. In a typical case reported by this author in a strabismic eye with limited vision, a round opacity was found on the posterior capsule of the lens, surrounded by transparent tissue. From this a whitish cord extended back into the vitreous, the central portion of which was dark as if pigmented, formed a spiral which disappeared in the fibrillæ of the vitreous, and, again reforming, swelled out into a button-like mass at the disc. The writer concludes that the two opaque hyaloid segments, a choroidal coloboma, and the posterior polar cataract support his theory as to the manner of development and absorption of the hyaloid artery.

F. Park Lewis.

Yamazaki, Z. **Contribution to the heredity of myopia.** Zeit. f. Augenh., 1927, v. 62, May, p. 49.

The author examined a large number of high myopes and their parents, in order to estimate to some extent the factor of heredity in this condition. Among children of high myopes, one finds many high myopes, but the parents of the earlier generation do not show many cases. This fact shows that high myopia is a resultant of two hereditary elements. In examining more than 1,906 families in his preliminary studies the author obtained the following results: (1) High, medium, and low myopia are, theoretically, not to be considered as being caused by the same hereditary elements, although they are interrelated to some extent. As a consequence of this fact, we may assume that the medium and low myopias are caused by one element only. (2) We must also accept that, beside the element of heredity, there are other contributing factors. (3) Whether the chief such factor is near work is not definitely established. *David Alperin.*

4. OCULAR MOVEMENTS

Lent, E. J., and Lyon, M. B. **Convergent strabismus, case report.** Jour. Indiana State Med. Assoc., 1928, v. 21, Feb., p. 66.

The authors present a case of alternating concomitant convergent strabismus more pronounced in the left eye, and with lateral nystagmus, which responded fully to complete correction of the refractive error and surgery. When first seen, at fifteen years of age, the patient's vision was O.D. 20/50, and O.S. 20/200 without glasses. Under homatropine cycloplegia, the following results were obtained: O.D. +0.50 sph. +1.50 cyl. ax. 90°, V. = 20/50; O.S. +2.50 cyl. ax. 90°, V. = 20/65.

Three weeks later a partial tenotomy of the left internal rectus was performed, with a tucking of the left external rectus, followed by a similar operation on the right eye ten days later. Six years later, with very similar corrective lenses, vision in the right eye equalled 20/40, and in the left 20/24. Binocular vision was 20/20. The visual axes were parallel and nystagmus absent on binocular fixation.

The angle of squint is not reported, but from the photograph it would appear to have been at least fifty degrees. *George H. Stine.*

Mellinghoff, Rudolf. **Securing sutures in muscle advancement for strabismus.** Klin. M. f. Augenh., 1928, v. 80, April, p. 498.

Mellinghoff describes his method and the needles with which he obtains a better hold of the sutures in the sclera. The needles are manufactured by Wm. Walb, Heidelberg, Germany, in two sizes of seventeen and twenty millimeter length and 7.5 and 8.5 millimeter radius. *C. Zimmermann.*

Ohm, J. **Latent nystagmus in total darkness.** Arch. f. Augenh., 1928, v. 99, July, p. 417.

This discussion of latent nystagmus in total darkness is elicited by the work of Bartels and Roelofs. The paper does not lend itself to abstraction. *Frederick C. Cordes.*

Pressburger, Erich. **Isolated tear of the superior oblique.** Zeit. f. Augenh., 1927, v. 62, July, p. 282.

This is published as the first case of isolated rupture of the superior oblique. *David Alperin.*

Ricaldoni, A. **Syndrome indicating involvement of the external cavernous sinus wall.** Rev. Oto-Neuro-oft., 1928, v. 3, Aug., p. 370.

The three motor nerves of the eye during their passage through the cavernous sinus are sufficiently near to allow all becoming involved by a single lesion. This may arise from the hypophysis, the sella, the sphenoidal sinus, the temporal lobe, or the external wall of the cavernous sinus itself, whether from meningitis, osteoperiostitis, compression by neoplasms, thrombosis, or infection. Thus these

various causes are capable of producing a partial or complete ophthalmoplegia of the corresponding side. The ophthalmic branch of the trigeminus, passing along the external wall of the cavernous sinus, is also in apposition to the motor nerves, and hence is liable to become involved in any lesion as far forward as the sphenoidal fissure or optic foramen. Thus an association of ophthalmoplegia with either neuralgia or anesthesia along the distribution of the ophthalmic nerve shows a lesion within the area where these structures lie in juxtaposition.

A case is reported as demonstrating this combination, which has been classed by van Gehuchten as "the syndrome of the cavernous sinus."

The patient was a woman thirty-six years old, who, two months prior to coming under observation, was seized with severe pain in the right supraorbital region, accompanied by considerable hyperesthesia of the skin in that area. Shortly afterward, diplopia was noted, the right lid drooped considerably, and gradually all ocular movement became impossible. When later examined, the patient showed total paralysis of the external muscles, with ptosis. This last, however, was more apparent than real, and was evidently resorted to in order to escape the diplopia arising from the paralyzed eye. When the normal eye was occluded, the right lid could be lifted considerably, although with the assistance of the occipitofrontalis.

The pupillary movements remained intact, showing the paralysis was entirely external. In addition, there was a mild exophthalmia, due probably to the muscular relaxation, and which could be reduced by gentle pressure. The blood Wassermann was negative, while the spinal fluid Wassermann was positive, the fluid showing in addition slight lymphocytosis. Under the influence of active antisyphilitic treatment, the condition quickly improved, and eventually disappeared altogether.

A. G. Wilde.

Robinowitsch, M. **Monocular nystagmus.** Zeit, f. Augenh., 1928, v. 65, June, p. 162.

Two cases of monocular nystagmus in blind eyes, in patients respectively nineteen and sixty years old, are briefly reported. The literature on this subject is scanty. The author reviews very briefly some of the theories in regard to the mechanism of nystagmus, emphasizing that Ohm has demonstrated that there are great variations in amplitude and frequency of the normal oscillations of the eyeball in different individuals, and that there are individuals with low frequency and great amplitude in whom this latent nystagmus changes to a manifest one under appropriate conditions. The author suggests that monocular nystagmus arises when one eye becomes blind in a person whose oscillations are normally of such amplitude and frequency that a manifest nystagmus can arise.

F. H. Haessler.

Sommer, Ignaz. **Labyrinth and squint.** Zeit. f. Augenh., 1928, v. 65, May, p. 14.

Bartels, on the basis of experiments on rabbits, concludes that a stimulated labyrinth influences the homolateral eye more than the contralateral one. This has been made the basis of a hypothesis according to which defects of the labyrinth are the cause of deviations of the eyes. Sommer made tests on thirty deaf-mutes with manifest squint. The labyrinthine reactions were studied, and in six patients films were taken of the eye during labyrinthine stimulation. He also tested squint patients with bilateral normal vision and patients with low visual acuity and no squint. Considering all of his experiments it was impossible to prove that the labyrinth always influenced the position of the eyes relative to each other, that the labyrinth could produce squint, or that labyrinth stimulation influenced the homolateral eye more than the other.

F. H. Haessler.

5. CONJUNCTIVA

Nielsen, E. O., and J. M. **Involutional cyclic conjunctivitis; report of four cases.** Jour. Michigan State Med. Soc., 1928, v. 27, April, p. 191.

The authors present a syndrome apparently not hitherto described in the literature, the characteristics of which suggest the name of involutional cyclic conjunctivitis.

The conjunctivitis is acute catarrhal in type, with much mucous secretion, but is bacteriologically negative. The attacks occur spontaneously at monthly intervals, frequently in one eye at a time, lasting three to five days. The condition remits spontaneously and is uninfluenced by local treatment. Males alone are affected, the age incidence being 47 to 55. The condition seems worse in those having definite endocrine imbalance, and responds to thyroid and orchic substance. Others cease spontaneously.

The only common features of the four cases were sex, gray irides, and the involutional period of life; and the gray irides may have been a coincidence. It is not asserted that all males or that these patients have mixed gonad tissue, but such a conception helps in understanding the manifestations. The authors believe that "certainly the monthly periodicity with a duration of a few days, with vascular dilatation and mucous discharge, is so characteristically female that a sex dyscrasia as a basis for the condition seems obvious."

(Four case reports, and comparative table.) *George H. Stine.*

Riehm, W. **Experimental anaphylactic keratoconjunctivitis in rabbits; with a discussion of the etiology of scrofulous eye inflammation.** Arch. f. Augenh., 1928, v. 99, July, p. 438. (See Section 6, Cornea and Sclera.)

Wolchonsky, S. **Parinaud's conjunctivitis.** Klin. M. f. Augenh., 1928, v. 80, May, p. 670.

A woman, aged twenty-five years, presented the following symptoms of Parinaud's conjunctivitis in the right eye: swelling of the lids, blepharospasm, chemosis, many large yellowish follicles and papillary exuberances of the palpebral conjunctiva, with swelling of the preauricular, submaxillary, and cervical glands. The cornea was clear. The microscopic examination of the conjunctiva as to tubercles was negative, only staphylococci and xerosis bacilli being found. There was no increase of temperature. Recovery after two weeks under irrigations of mercury cyanide. The author considers this case, and Parinaud's conjunctivitis in general, near to tuberculosis. The fact that the patient came much in contact with cattle may have rendered an infection possible.

C. Zimmermann.

6. CORNEA AND SCLERA

Betsch, A. **Chronic filiform keratitis from defective lacrimal secretion.** Klin. M. f. Augenh., 1928, v. 80, May, p. 618. Two cases, described in detail, are attributed to defective lacrimal secretion. The connection with disturbance of endocrine secretion, chiefly climacteric influences, was pronounced.

C. Zimmermann.

Blatt, Nikolaus. **Malignant course of rosacea affections of the eyes.** Klin. M. f. Augenh., 1928, v. 80, May, p. 624.

Three cases are described. The pathological variability of their clinical symptoms confirmed the known fact that there is no characteristic pathological picture of this disease. One case presented a condition similar to rodent ulcer of the cornea, the second resembled eczematous keratitis with marginal infiltrations and ulcers, and the third parenchymatous keratitis, scleritis, and episcleritis. Gout and tuberculosis could be excluded. The synchronism of episcleral and scleral eruptions with those of the face and their simultaneous improvement indicated their etiological connection. Coarse vascular convolu-

tions, with keratectasia resulting from the lowered resistance of the cornea in the presence of deep opacities, presented a rare and especially malignant type of ocular rosacea. Absence of exudation and secretion indicated an affection intermediate between inflammatory and degenerative corneal processes. Two of the patients were women who had climacteric irregularities. Acne rosacea occurs predominantly in women, and the author assumes disturbances of the endocrines, confirmed by the peculiar vascular changes. *C. Zimmermann.*

Kugelberg, F. **Tattooing according to Knapp.** Klin. M. f. Augenh., 1928, v. 80, June, p. 813.

Kugelberg treated, in India, at least eighty cases with P. Knapp's tattooing. Frequently the leucomas were operated on in one sitting, at first removal of the epithelium was done, then optical irridectomy, and finally tattooing according to Knapp. The author had good success.

C. Zimmermann.

MacCallan, A. F. **Treatment of hypopion keratitis.** Tr. Ophth. Soc. United Kingdom, v. 47, p. 59.

There is nothing specific about the causation of hypopion ulcer by the pneumococcus. The main point in its development is the unhealthy state of the corneal tissue, caused by absorption of toxins from some septic focus. The first point is to remove or mitigate such septic focus. Next, do not close the eyelids, by applying fomentations or dressings. Closure of the lids prevents the exit of pus and the warmth favors the growth of microorganisms. The superficial epithelium of the conjunctiva should be destroyed by daily applications of two per cent silver nitrate solution. A bowl of lotion containing pledgets of absorbent cotton should be placed beside the patient, who should bathe his eyelids every ten minutes while awake; and at longer intervals he should be awakened for this purpose. This is called a "constant wash," and supervision of the patients should be kept up to ensure its regular use. Adequate irrigation by a nurse should be repeated every four hours. The lotion preferred is the ordinary surgical eusol solution diluted with an equal volume of water. A similar lotion of chlorine water has also been recommended.

The surgical treatment is by gently scraping the necrotic tissue from the base of the ulcer, and especially from the edges. Any fibrinous mass of the hypopion should be gently removed from the anterior chamber with forceps, and the eye then bandaged for a few hours. The anterior synechia which forms causes vascularization, without which the healing cannot occur. Atropin may be of value in preventing pain. The use of eserin in such ulcers frees the angle of the anterior chamber, favoring natural drainage, and keeps the iris near the base of the ulcer, to vascularize its edges if perforation takes place. Paracentesis may be employed rather than the Guthrie-Saemisch section. Routine cauterizations are harmful. The treatment is the same, whatever may be the organism most prevalent in scrapings from the base of the ulcer.

E. J.

Mita, Hiroshi. **Experiments on the deleterious effect of trypaflavin on the eye.** Klin. M. f. Augenh., 1928, v. 80, May, p. 657. (2 ill.)

In a case of blennorrhea in an adult, after two daily instillations of a one per cent solution of trypaflavin, Mita observed a diffuse yellow opacity of the cornea with marginal ulcers. He therefore tested the one per cent solution on twelve rabbits, and found that trypaflavin easily entered the cornea by damaging the epithelium, especially when defective. It also had a deleterious effect on the endothelium. Hence it is not an indifferent preparation, especially in acute inflammations of the conjunctiva, which are apt to be complicated by corneal affections.

C. Zimmermann.

Mulock Houwer, A. W. **Filamentous keratitis and chronic arthritis.**

Trans. Ophth. Soc. United Kingdom, v. 47, p. 88.

Cases of the particular group here discussed begin almost unnoticed, increase slowly, and remain stationary for years, with remissions and exacerbations. They are bilateral, are not accompanied by any other disease of the eye, and have resisted every kind of treatment. The author has seen nine cases, most of them under observation three years or more. The patients complain of itching, epiphora, and photophobia, none very serious. There is considerable secretion, chiefly composed of threads of whitish slimy material that may be an inch or more long. There is slight hyperemia and swelling of the conjunctiva. On the cornea are filaments one to five mm. long, varying from a few to one hundred or more, most abundant on the lower half and the periphery of the cornea, and almost absent at the center. Between the filaments, small infiltrations which may stain with fluorescein are often found on the corneal surface. The corneal stroma and nerves are normal. Of the nine patients the youngest (29 years) and the oldest four (56 to 65) suffered from arthritis. One patient had cataract and operation gave a very good result. In one case there were threads on the conjunctiva, but only a few on the corneal margin.

As in England gout seems more prevalent than in the Netherlands, the author asked his hearers if they had come across such cases. Mr. J. Gray Clegg had seen cases of an arthritic conjunctivitis that sometimes ran on into a filamentous keratitis.

E. J.

Orloff, K. C. **Keratitis produced by aspergilli.** Russkii Opht. Jour., 1928, Aug., pp. 182-185.

The author reports ten cases of keratomycosis, which seems to be frequent in the southeastern part of Russia. In eight of these cases Aspergillus fumigatus could be isolated. Two clinical forms of corneal aspergillosis are described, a mild lesion similar to a phlycten, and a severe ulceration accompanied by hypopion.

M. Beigelman.

Prins, C. Kinkler, Jr. **On limbus pigment.** Klin. M. f. Augenh., 1928, v. 80, May, p. 612. (3 ill.)

Prins observed changes of limbus pigmentation during the recovery from experimental corneal tuberculosis. In agreement with former authors, the pigment was almost exclusively localized in the epithelial layer, and the pigmentation of the cornea was produced by spreading of the limbal epithelium.

C. Zimmermann.

Riehm, W. **Experimental anaphylactic keratoconjunctivitis in rabbits;** with a discussion of the etiology of scrofulous eye inflammation. Arch. f. Augenh., 1928, v. 99, July, p. 438.

Riehm presents a detailed and excellent paper on his extensive and painstaking experimental work on anaphylactic keratoconjunctivitis in rabbits. He concludes that in scrofulous conjunctivitis there is a sensitivity of the patient to tuberculosis. The starting point of this irritation is particularly prone to be a trauma of the conjunctival sac. The irritation may arise through the direct introduction of tuberculous material into the conjunctival sac; or in a roundabout way from nonspecific inflammation of the eye through superimposed infection from the lacrimal fluid (Weekers). If a patient has had a phlyctenular keratitis, the specific substance may be introduced by the blood stream causing a flare-up of the condition in the form of the resistant phlyctenular type. There is frequently present a combination of these methods.

Frederick C. Cordes.

Terson, A. **Syphilitic and hybrid ulcers of the cornea.** Ann. d'Ocul., 1928, v. 165, Aug., pp. 561-570.

The syndrome of gumma and ulceration of the cornea in hereditary syphilis is undeniable and is readily responsive to antisyphilitic treatment, unlike the severe parenchymatous

keratitides. In any corneal ulcer it is wise to test for syphilis. So-called antiluetic treatment is of great value even in nonluetic cases. In acquired syphilis purely syphilitic ulceration is exceptional. *L. T. P.*

Vogelsang, K. **Comparative investigations on the sensibility of conjunctiva and cornea.** Klin. M. f. Augenh., 1928, v. 80, May, p. 608.

By measuring the reaction time, Vogelsang found a greater sensibility of the center (one and a half times higher) of the cornea than of the conjunctiva in an area within 0.5 cm. of the limbus. *C. Zimmermann.*

7. UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Bistis, J. **Clinical and experimental study upon the rôle of the sympathetic in the etiology of heterochromia.** Arch. d'Opht., 1928, v. 45, Sept., p. 569.

A review of the literature upon heterochromia shows that certain writers have ascribed the diminution of color of the iris and other pathological findings in the lighter eye to a low grade uveitis, either intrauterine or of later development. Many of the more recent authors have noticed the miosis and narrowing of the palpebral fissure associated with the lighter eye, and have suspected a lesion of the sympathetic. The writer used rabbits, in whom he destroyed the superior cervical sympathetic ganglion on one side. He found that in those which lived for over six months a heterochromia developed, with the lighter eye on the side of the lesion. Histological preparations showed a diminution in the pigment of the stroma of the iris but no change in the pigment epithelium. It is concluded that heterochromia, either congenital or acquired, unless preceded by ocular inflammation, is to be considered as a result of paralysis of the cervical sympathetic. Corneal precipitates and cataract, often associated with heterochromia, are considered as results of vasomotor disturbances and not of inflammation of the ciliary body. (Bibliography.)

M. F. Weymann.

Franceschetti, A., and Wieland, H. **The influence of diuretics upon the albumin content of the intraocular fluids.** Arch. f. Augenh., 1928, v. 99, July, p. 367.

Franceschetti and Wieland found that diuretics produced an increased albumin content of the intraocular fluids of rabbits, probably by increasing bloodvessel permeability. Intramuscular injections of theophylin produced a definite increase in the albumin content of both aqueous and vitreous. This was greatly increased by repeated injections. The use of novasurol and salyrgan produced similar results. Insulin produced no apparent effect. With pituglandol, which prevents resorption, repeated injections gave no diminution in the albumin content of the anterior chamber after the second aqueous puncture in rabbits; in fact it diminished the effect of the diuretics, particularly novasurol and salyrgan.

Frederick C. Cordes.

Hofe, K., and Perwitzschky, R. **Course of the oculopupillary fibers of the sympathetic.** Arch. f. Augenh., 1928, v. 99, July, p. 405.

The authors point out that anisocoria or other symptoms of sympathetic injury rarely follow middle ear disease or radical operation. With middle ear disease or radical operation they frequently found anisocoria upon instillation of cocaine. The results were not uniform. Sometimes the diseased side showed the wider pupil and at other times the normal side. This they attribute to the method of instillation. Faradic stimulation of various portions of the mucous membrane of the middle ear gave no sympathetic effect. From their work, they cannot agree with the statement that oculopupillary fibers of the sympathetic frequently go through the middle ear.

Frederick C. Cordes.

Poos, F. **On the innervation of the ciliary muscle by the sympathetic nerve and its significance for accommodation.** Klin. M. f. Augenh., 1928, v. 80, June, p. 749.

During experimental investigations on the isolated muscles of the iris, Poos found peculiarities of their reactions to physiological and pharmacological excitation, which must lead to a revision of our views on pupillary mechanism. Instead of a pure antagonism one must think of a kind of synergism evidenced in the associated innervation of dilatator and sphincter. A chief function of the dilatator is to keep the iris in equal tension, and to fixate the pupillary diameter established by the sphincter, the pupillomotor muscle proper. Systematic examination of sympathetic stimulating drugs (cocain, ephedrin, ephetonin, adrenalin), which the author has good reasons to assume act on the endings of the sympathetic in the iris, disclosed the fact that they all, just as in the sphincter, produce a paresis of the ciliary muscle of the normal eye. This, in conjunction with the special pharmacological behavior of paralysis of the sympathetic, renders it very probable that the sympathetic exerts on the motor part of accommodation an influence similar to that on the pupillary mechanism. *C. Zimmermann.*

Villard, H. **Treatment of sympathetic ophthalmia.** Arch. d'Opht., 1928, v. 45, Aug., p. 490.

The patient developed sympathetic ophthalmia twenty-two months after a perforating wound by a metallic fragment. The injured blind eye was immediately enucleated and the usual treatment with atropin in the sympathizing eye was begun. The patient also received intravenous salvarsan, sodium salicylate, and cyanide of mercury. As no improvement was noted, a sterile abscess was caused by the injection of 1 c. c. of turpentine. Immediately the eye improved but later it relapsed. Again turpentine, 0.5 c. c., was injected and 10 c. c. of electrargol was given intravenously. Again the eye improved, but a week later the iridocyclitis was worse, and this time an injection of 1 c. c. turpentine was given along with the intravenous electrargol. During this period the routine treatment mentioned above was also used. After this the eye improved, until upon examination six months later the vision was 20/20 and the eye apeared normal. The writer seems convinced that the use of intravenous electrargol and not less than 1 c. c. of turpentine for abscess formation, in addition to our usual treatment for sympathetic ophthalmia, can be depended upon for a cure.

M. F. Weymann.

8. GLAUCOMA AND OCULAR TENSION

Elschnig, A. **Glaucoma.** Graefe's Arch., 1928, v. 120, p. 94.

The author refers to "compensated glaucoma" as characterized by cupping of the optic nerve associated with increase of tension. Uncompensated glaucoma he divides into prodromal, acute, and chronic forms. The prodromal attacks represent a disturbance of compensation which spontaneously disappears leaving the eye with normal tension, optic nerve, and function. The acute type includes the disturbances of compensation which do not disappear spontaneously and which leave changes. Cases of chronic uncompensated glaucoma have a lasting disturbance of compensation, sometimes leaving under miotics, but only to reappear immediately after the miotics are left off. The essential difference between the compensated and uncompensated types of glaucoma is that in the former, without miotics, there is never any corneal edema, widening of the pupil, or atrophy of the iris.

The pathological anatomy of eyes recently affected with glaucoma and having a disturbance of compensation is given in detail. *H. D. Lamb.*

Fabritius, August. **Vomiting and retardation of pulse in acute glaucoma.** Klin. M. f. Augenh., 1928, v. 80, May, p. 668.

During an attack of acute glaucoma, caused by violent emotion, Fabritius observed vomiting, and a pulse of forty-four beats per minute, which he attributed to a reflex action produced by increased intraocular pressure (fifth and tenth nerves). *C. Zimmermann.*

Feigenbaum, Arieh. **The influence of illumination and obscuration on the intraocular pressure of normal and glaucomatous eyes.** Klin. M. f. Augenh., 1928, v. 80, May, pp. 577 and 596. (23 ill.)

From his numerous adaptation tests with dark-light experiments, Feigenbaum found a direct dependence of dark adaptation upon intraocular tension. In pathological hypertension dark adaptation is more or less disturbed. The moment at which rise of tension is noticeable in the dark is after between forty and forty-five minutes. From then on the glaucomatous eye, during continued darkness, registers decreased sensibility. After lowering the tension by medicaments (pilocarpin, gynergen), the disturbance of dark adaptation may cease. The permanent disturbances of dark adaptation in glaucoma are probably due to the frequently recurring temporary hypertensions. Hypertension may influence dark adaptation by obstruction of the vessels supplying the sensory elements, and by directly damaging the nervous end organs or their conduction paths. In view of transient disturbances of dark adaptation the primary lesion is probably brought about by impeded blood circulation. If this can be removed, restitution is possible. Changes in the retinal elements themselves or in their conduction are secondary. They are the cause of definitive disturbances of dark adaptation. Good central vision and normal visual field need not exclude considerable disorders of dark adaptation, and vice versa. The diminution by pilocarpin of dark adaptation in the normal eye is merely due to the miosis, but in the glaucomatous eye the lowering of tension and increased sensibility result in an increase of adaptation. The result of adaptation tests, especially by the protracted method in combination with the light-dark experiment, may be of value for early diagnosis of glaucoma.

C. Zimmermann.

Geiger, C. W., and Roth, J. H. **Intraocular hypertension relieved by the removal of focal and systemic infections.** Illinois Med. Jour., 1928, v. 53, Feb., p. 110.

A report of four cases is offered to demonstrate that focal infection may be a factor in the production of both acute and chronic simple glaucoma, and that elimination of the focal and systemic infection may affect the progress of the disease even after medical and surgical measures have failed to control the condition. In this way atrophy following apparently successful operation may be prevented. Early attention to focal and systemic infection, and routine fields and tension-taking in these patients, especially those past fifty years, may prevent later glaucomatous trouble. (Bibliography, case reports and discussion.)

George H. Stine.

Goldenburg, Michael. **The iridotasis operation for glaucoma.** Illinois Med. Jour., 1928, v. 53, Feb., p. 101.

Notwithstanding adverse criticism based on academic grounds, the clinical results of 105 cases in which iris incarceration (iridotasis) was performed demonstrate the value of this operation.

The operation was used in buphthalmus (4 cases), glaucoma simplex (27), congestive type (60), secondary glaucoma (7), and in 7 unclassified cases. The results were most brilliant in the congestive or inflammatory type. Pain was relieved almost at once and all symptoms showed rapid improvement. Hospitalization period was also shortened. The average tension before operation was 51.5, and after operation 21 by Schiötz.

In glaucoma simplex the immediate results were equally favorable but not so brilliant. Most of the cases were

in the very late stages. Average tension before operation was 40.25, and afterward 22.5. Vision can not be restored where the nerve fibers are already enfeebled or destroyed.

Buphthalmus does not respond well. To overcome the difficulty of retaining the prolapsed iris in the limbal wound the author attempts prolapse at two different points through small incisions. Very good results were obtained in secondary glaucoma, in which the operation was used only as a last resort.

Complications, namely severe hemorrhage, injury of the lens, choroidal hemorrhage, failure to prolapse the iris, diabetes, and the presence of cataract were met in nineteen cases, three of which ended in enucleation. Reoperation was necessary in seven cases owing to postoperative rise of tension.

Subconjunctival drainage is more important in the congestive type, while in glaucoma simplex the intraocular channels may be of greater import. Here, iris traction alone may serve to reestablish aqueous equilibrium. The author believes that the vague and indefinite symptoms recurring from time to time in cases where the tension has been continuously normal after a well performed operation are due to repeated attacks of drainage interference.

(Four analytical charts and case reports on complications.)

George H. Stine.

Gradle, Harry. **The non-operative treatment of glaucoma.** Illinois Med. Jour., 1928, v. 53, Feb., p. 126.

Although the majority of cases of glaucoma simplex eventually become operative, surgery is not indicated so long as miotics and massage control the condition. In the beginning and for continued use the best miotic is a weak solution of pilocarpin (0.5 or one per cent): eserin is too powerful and is not well tolerated over a long period of time in the majority of cases. Non-operative treatment is not satisfactory if eserin is required.

In watching the triad of symptoms (tension, fields, vision), it is essential that the patient be seen at approximately the same time every day because of the diurnal variation of intraocular tension. Also, a definite interval should elapse between the time of instillation of the miotic and the time of examination.

Amine glaucosan is the most powerful miotic known and is useful in acute congestive types. Glaucosan has the same action as adrenalin and should therefore be used with caution, especially in the later cases with adhesions, lest it causes acute hypertension. With these miotics, tension may be lowered so that pilocarpin will again control it. (Discussion).

George H. Stine.

Judin, K. A. **The comparative value of some glaucoma operations.** Russkii Opht. Jour., 1928, Aug., pp. 177-181.

The author discusses the results of 821 operations performed in various forms and stages of glaucoma. In acute glaucoma the immediate results of an iridectomy were always satisfactory, but in a period of from one to three years fifty per cent of these cases developed increased tension. In chronic inflammatory glaucoma iridectomy reduced pressure in twenty-eight per cent while Elliot's trephining was efficient in seventy-eight per cent of the cases operated upon, the period of observation being more than one year. In several cases of chronic glaucoma, where an iridectomy was performed on one eye and a trephining was done simultaneously on the other eye, the latter procedure proved to be more efficient. In seven cases of chronic inflammatory glaucoma, whereas iridectomy failed to reduce the pressure, subsequent trephining relieved it. In absolute glaucoma, opticociliary neurectomy (thirteen cases) relieved the condition in one hundred percent, cyclodyalisis (seventeen cases) in sixty per cent, and Elliot's trephining in about fifteen per cent of the cases operated on.

M. Beigelman.

Mauksch. **New operation for glaucoma.** Arch. de Oft. Hisp. Amer., 1927, v. 27, Oct., p. 658.

After a short review of the various procedures already recommended in the treatment of glaucoma, Mauksch describes his operation, which consists of a combination of the cyclodialysis of Heine and the iridencleisis of Holth. The object sought is to line the new tract with an epithelium that will act as an effective drain from the anterior chamber, and at the same time prevent closure of the chamber. An incision is first made through the conjunctiva well back toward the equator, and the sclera is pierced on the temporal side about ten mm. from the limbus. The ciliary body is then separated from its scleral attachment by means of a spatula, so that the tip of the instrument comes into the anterior chamber. An iris forceps is then introduced through the same incision, and is pushed forward, seizing the pupillary border of the iris, and drawing it backward between the sclera and ciliary body, although not so far as the scleral incision. It is believed the iris epithelium will assist in keeping the channel patent. The increased rate of aqueous absorption, combined with the ciliary atrophy following the cyclodialysis, serves to maintain the intraocular tension within normal limits. *A. G. Wilde.*

Müller, Paul. **Ephedrin in ophthalmology.** Klin. M. f. Augenh., 1928, v. 80, May, p. 669.

Ephedrin produces mydriasis after a few minutes, not maximal, but sufficient for diagnostic purposes. Its effect lasts from three to twelve hours, and can be immediately overcome by a drop of pilocarpin. Paralysis of accommodation is only slight, and the tension remains unaltered. It is therefore of advantage in glaucoma. Repeated daily instillations during two and a half years never caused glaucoma, and in chronic glaucoma the tension was never influenced. Recently Merck has manufactured synthetically ephetonin, which may be used with the same good results.
C. Zimmermann.

Schmelzer, Hans. **The pathology and therapy of glaucoma.** Graefe's Arch., 1928, v. 120, p. 14.

The author undertakes a comprehensive survey of the glaucoma problem, quoting many authors in early and recent literature. He discusses the action of adrenalin (glaucosan), the effect of extirpation of the cervical sympathetic, and the action of ergotamin (gynergen) on intraocular tension. He recommends the conservative treatment of glaucoma with miotics and adrenalin (glaucosan), and operation only when these medicines fail. *H. D. Lamb.*

Seidel, E. **Recent views on interchange of intraocular fluids and the origin of intraocular tension.** Klin. M. f. Augenh., 1928, v. 80, June, p. 721.

This is a critical discussion of the monograph of Duke-Elder, in which a new theory of dialysis is advanced against the filtration theory of Leber and the secretion theory. Seidel shows by numerous arguments that he, as various English authors conversant with the subject, can not agree with Duke-Elder's theory.
C. Zimmermann.

Shoji, Y. **Experiments on autoregulation of intraocular tension.** Ann. d'Ocul., 1928, v. 165, Aug., pp. 593-597.

The intraocular tension of thirty-four healthy test subjects averaged twenty mm. Hg. After forty grams weight was applied the tension rose to forty mm. Hg. In fifty-seven seconds it had returned to normal while the weight was still applied, and then it became subnormal for a period of three minutes or more before returning to normal. These figures are averages, there being considerable individual variation. *L. T. P.*

VomHofe, K. **Diminished tension in so-called primary glaucoma.** Arch. f. Augenh., 1928, v. 99, July, p. 410.

Hofe points out that in monocular glaucoma the apparently well eye at times shows marked diminution of tension with miotics. Perhaps this should be regarded as due to latent glaucoma or as indicating an eye disposed to glaucoma. He also presents a case of acute glaucoma that gave with miotics marked hypotension followed by marked hypertension.

Frederick C. Cordes.

9. CRYSTALLINE LENS

Moulton, Herbert. **Experience in cataract extraction.** Jour. Oklahoma State Med. Assoc., 1928, v. 21, Feb., p. 36.

The paper is a general discussion of two hundred consecutive cataract extractions over a period of thirty-five years, with more detailed reference to four cases. Various methods, the Smith Indian excepted, were used. Final results were: vision 20/20 to 20/50, 113 cases; 20/50 to 20/100, 58 cases; 20/100 to 20/200, 20 cases; less than 20/200, 9 cases.

George H. Stine.

Panico, E. **Naphthalin cataract.** Ann. di Ottal., 1928, v. 56, Sept., 799-816.

The literature bearing on the experimental production of cataract by naphthalin and on the few cases observed in man is reviewed. The author used thirty rabbits for feeding experiments, giving one gm. naphthalin in olive oil per kilo daily. The first changes seen were swelling and necrosis of the epithelium of the anterior lens capsule. Irregular epithelium was developed on the posterior capsule. Water fissures were seen in the cortex and the lens fibers assumed a granular appearance in section. Vacuoles appeared around the nucleus. Iridescent needles could be seen very early with the slit-lamp, before water sutures appeared. The lenses increased in volume and in anteroposterior diameter. Lenses removed in the capsule and placed in the serum of naphthalinized animals increased in volume and weight as compared with lenses placed in normal serum, whereas no changes were produced by direct contact with naphthalin. No changes in retina or uveal tract were seen which would account for the lens changes. The author believes products are developed in the body following the injection of naphthalin which would have a toxic effect on the lens, especially its epithelium.

S. R. Gifford.

Wolfe, Otis. **Advantages of the Barraquer method in immature and hypermature cataract.** Jour. Iowa State Med. Soc., 1928, v. 18, Feb., p. 49.

The literature is reviewed and five cases reported to substantiate the author's view that intracapsular extraction is advantageous in any type of senile cataract, and that the best intracapsular method is that of Barraquer. Less possibility of rupturing the capsule gives it a decided advantage over the Knapp method. Vitreous loss is almost negligible, as suction ceases as soon as the lens capsule fills the Green erisiphake, and rocking the lens not only ruptures the suspensory ligament but also does away with vacuum behind the lens. Furthermore a Kalt silk suture in the large conjunctival flap prevents later gaping of the wound. Preliminary iridectomy is performed in every case, and the use of infrared radiation to reduce inflammation and promote rapid healing is highly recommended. (Bibliography and five case reports.)

George H. Stine.

10. RETINA AND VITREOUS

Csapody, J. **Treatment of detachment of the retina.** Klin. M. f. Augenh., 1928., v. 80, May, p. 641.

Four cases are reported: A detachment in a woman aged fifty-two years, with ten diopters of myopia, was cured by two scleral punctures six and eleven days after the first examination. Scleral puncture one week after the onset of detachment in a woman aged twenty years, with five diopters of

myopia and probably tuberculous choroiditis, effected complete and permanent reattachment. Detachment in a man aged forty-four years, with ten diopters of myopia and specific choroiditis and iritis, gradually disappeared after colmatage and antispecific treatment, but relapsed after six and a half months. In a man aged twenty-nine years, with old detachment, the colmatage improved only the tension. Beside punctures, the author recommends tuberculin in cases of suspected tuberculosis. *C. Zimmermann.*

Espildora Luque, C. **Obstructions of the retinal artery.** Arch. de Oft. de Buenos Aires, 1928, v. 3, Aug., p. 550.

In seventy per cent of individuals the macula contains a double circulation, one from the terminals of the superior and inferior temporals, the other from independent maculopapillary branches arising from the central artery, and proceeding directly from the disc to the macular region. In these cases, central vision may be preserved after obstruction of the temporal arteries.

A case is reported of a twenty-seven year old man, who had sudden loss of the upper half of the right visual field. Below, his vision was unimpaired, its upper limit being marked sharply by a horizontal line which passed over the point of fixation. This preservation of the macula was due to two definitely marked maculopapillary arteries running from the disc horizontally outward to the fovea. The fundus was seen divided into two distant areas, the upper of normal hue, with its vessels undisturbed, the lower distinctly pale, while the artery supplying the latter region showed complete obliteration of both the main trunk and its branches. *A. G. Wilde.*

Gonin, J. **My most recent experiences concerning detachment of the retina.** Arch. d'Opht., 1928, v. 45, Sept., p. 555.

Ten more patients were treated for detachment of the retina by the method of thermocauterization over the retinal tear. The results not only showed increased vision, but reattachment lasting for periods of several months. The details of technique of the treatment are not given in this article. *M. F. Weymann.*

Kiso, Keigo. **The inheritance of medullated optic nerve fibers of the retina.** Graefe's Arch., 1928, v. 120, p. 154.

Six cases of medullated optic nerve fibers were present in one family. From a review of the literature and in his own experience, Kiso can state that in most of the cases of considerable extent of medullated nerve fibers, other kinds of congenital anomalies are present. In four of the latter cases in Japan showing no other congenital anomalies, congenital lues was present. The cases with a large extent and those with a small area of medullated nerve fibers are produced by one and the same hereditary elements.

H. D. Lamb.

Mann, Ida C. **The process of differentiation of the retinal layers in vertebrates.** Brit. Jour. Ophth., 1928, v. 12, Sept., p. 439.

The author's investigations of the development of the various nuclear and fibrillary layers of the adult retina from the undifferentiated neural ectoderm of the walls of the optic cup indicates that this is a complicated process. A study of its stages in animals representative of the various classes of vertebrates brings out the interesting fact that a basal plan exists for the entire phylum. The contribution does not lend itself readily to abstract. There is an underlying principle which remains unchanged, as well as an evolutionary scale of modifications superimposed on this. In every case the ganglion cells are the first to differentiate, the amacrine cells are intimately associated with the ganglion cells and only secondarily separated from them; the inner nuclear layer is a complex layer containing elements derived from both the primitive retinal layers (i.e.

the inner and the outer neuroblastic layers), and the percipient elements themselves are the last to differentiate. From a study of the secondary modifications we see that supporting tissue differentiates relatively late in phylogeny; that abbreviation of stages can occur without modification of the general plan; and that throughout phylogeny there is a tendency to improvement of function by crowding together of percipient elements and by development of special areas of acute vision, the differentiation of which, however, always follows the original general plan.

D. F. Harbridge.

Rehsteiner, Karl. **Ophthalmoscopic observations on changes in the periphery of the fundus of myopic and senile eyes.** Graefe's Arch., 1928, v. 120, p. 282.

Localized changes in the periphery of the fundus are more frequent in myopic than in nonmyopic eyes; the greater degree of myopia the greater the number of these areas. In anisometropia only the myopic eye shows these degenerations. With increasing age the frequency of these myopic changes becomes greater. In elderly individuals there occur the same peripheral foci in nonmyopic eyes, although they are much fewer and smaller. The myopic and senile degenerations are morphologically similar: they consist of white to jellowish-white areas of varying size, usually containing several proliferations of pigment, or they are simply black areas. Large band-shaped areas can occur by confluence of small foci.

The myopic and senile foci of the periphery of the fundus are degenerative processes analogous to myopic and senile degenerations around the optic nerve and at the macula. The changes in the periphery of the fundus are probably due to exogenous factors (inflammations, near work, stretching of the coats of the eye) as are the myopic ring and macular degeneration. A scientific explanation for both sets of changes is afforded only by regarding them as inherited.

H. D. Lamb.

Sédan, Jean. **Retinal detachment improved after acute glaucoma.** Ann. d'Ocul., 1928, v. 165, Aug., pp. 582-587.

In an eye previously attacked by luetic iritis, detachment of the lower half of the retina followed a blow from a ball. No improvement had resulted from a rest in bed, subconjunctival injections, or galvanic cautery, but seven days after an intervening acute glaucoma with tension of 38 mm. (Schiötz) the condition was relieved by puncture of the iris bombé, the detachment began to disappear, and ultimately the field returned almost to normal. *L. T. P.*

Seefelder, R. **Clinical and anatomical contribution to the so-called disciform degeneration of the retinal center.** Graefe's Arch., 1928, v. 120, p. 139.

Under the term of disciform degeneration of the center of the retina, first applied by Junius and Kuhnt in 1926, R. Seefelder reports seven cases, one of which was anatomically examined. In three of the cases the condition was bilateral. The characteristic change is a large white elevated area occupying the entire macular region and containing pigment. In the one case microscopically examined, the white elevated area consisted chiefly of connective tissue lying between the choroid and retina and detaching the latter. Scattered in this mass of connective tissue were pigmented cells from the pigment epithelium. *H. D. Lamb*

11. OPTIC NERVE AND TOXIC AMBLYOPIAS

Hagedoorn, A. **An anatomical contribution concerning circumscribed excavation of the optic disc.** Arch. f. Augenh., 1928, v. 99, July, p. 387.

Based upon an unusual specimen, Hagedoorn describes anatomical substrata of a central circumscribed excavation of the papilla which could

easily similate a true glaucomatous cupping. He describes in detail the embryological development of this anomaly. *Frederick C. Cordes.*

Herzog, H. **Retrobulbar neuritis.** Arch. f. Augenh., 1928, v. 99, July, p. 292.

Herzog feels that retrobulbar neuritis of rhinological etiology is a relatively rare condition. He reports seventy-five cases of retrobulbar neuritis, divided into two classes. The first includes patients who came primarily for the eye symptoms, the second includes patients who came because of the nasal condition. Of the twenty-eight patients who came because of eye symptoms, twelve showed a possible etiology aside from the nose. Of these, none showed complete recovery under the nasal treatment and only two showed an improvement. Of the sixteen who were negative on physical examination, treatment of the nasal condition gave complete recovery in nine, and partial recovery in four cases. In a series of five hundred cases of acute and chronic nasal infection, only nine per cent showed any evidence of central or peracentral scotomata. In this group were thirteen cases of ocular disturbance without evidence of other than nasal etiology. Ten of these patients showed complete recovery under nasal treatment, one partial, and two no change.

Herzog emphasizes the necessity of careful physical examination, and also of remembering the possibility of early multiple sclerosis.

Frederick C. Cordes.

Meyer-Steineg, Nora. **Congenital field defects.** Arch. f. Augenh., 1928, v. 99, July, p. 501.

Meyer-Steineg reports six cases of congenital field defects of her own, together with one case from the literature. Three of these cases were congenital colobomata that simulated glaucomatous cupping, in which the fields showed enlarged blind spots and paracentral scotoma. In one patient, in addition to this there was a hypoplastic inferior nasal artery, so that the field showed a paracentral scotoma with incomplete quadrant hemianopsia. Another patient had a similar condition of the inferior temporal artery, with a field defect in the superior nasal quadrant. There was also an apparent coloboma of the macula, with a central scotoma.

Frederick C. Cordes.

Nonay, Tibor. **Intestinal worms as cause of optic neuritis.** Klin. M. f. Augenh., 1928, v. 80, May, p. 674.

A woman aged forty years complained for five days of sudden impairment of sight and pain in the left eye. The vision was reduced to counting fingers at two meters. There was absolute central scotoma for colors, and optic neuritis. Internal examination revealed oxyuris. Two days after the use of laxatives the vision rose to 6/60, and it was normal after ten days. The affection was attributed to toxins from the decay of dead parasites, and also to the products of their regressive metabolism.

C. Zimmermann.

Orton, Samuel T. **Specific reading disability-strephosymbolia.** Jour. Amer. Med. Assoc., 1928, April 7, p. 1095.

Early observation in these cases came from ophthalmologists, and the condition was considered to be a specific disease entity and was called congenital word-blindness. Orton recognizes certain features which were common to a group of school children referred to him. This particular group had (1) "difficulty in differentiating *p* and *g* and *b* and *d*; (2) a striking tendency to confuse palindromic words like *was* and *saw*, *not* and *ton*, and to reverse paired letters or even whole syllables or words in reading, so that they were read from right to left instead of from left to right; (3) a considerable degree of capacity to read from a mirror (one boy actually read faster and with fewer mistakes with a mirror than without: and (4) a greater facility in producing mirror writing,

i.e. in writing to the left with complete aintitropic reversal of all letters."

The term strephosymbolia—twisted symbols—is chosen by the investigator to demonstrate this particular group, which exhibited a typical symptomatology. Both his preliminary studies and further studies, not as yet published, indicate that retraining experiments are exceedingly promising, and that the reading disability is not related to feeblemindedness, but may occur at any intellectual level.

D. H. O'Rourke.

Scheerer, R. **Certain diseases of the optic nerve trunk.** Arch. f. Augenh., 1928, v. 99, July, p. 322.

Scheerer discusses the diseases of the optic nerve trunk that show central field changes. About fifty-five-per cent of these cases show multiple sclerosis. Of the remainder some will at a later date show this disease. A certain percentage have nasal infections as a basis. There are also patients in whom the changes are probably due to blood vessel occlusion.

Frederick C. Cordes.

Weekers, L., and Missotten, R. **Should the amaurosis of pregnancy, wrongly called uremic amaurosis, necessitate interruption of pregnancy?** Arch. d'Opht., 1928, v. 45, Sept., p. 545.

With an attack of amaurosis in the eighth month of pregnancy, the patient was allowed to go to term. A healthy child was born and the mother recovered normal vision. There was no uremia. From a survey of the literature it is concluded that simple amaurosis of pregnancy offers a favorable prognosis and does not indicate interruption of pregnancy unless accompanied by visible intraocular pathology. The amaurosis is likely to recur in succeeding pregnancies but this is no contraindication to permitting further childbearing. The whole general picture of toxemia should be considered in interrupting pregnancy rather than the amaurosis alone. (Bibliography)

M. F. Weymann.

13. EYEBALL AND ORBIT

Dejean. **Pseudoossification of the vitreous and osteogenic proliferating cyclochoroiditis.** Arch. d'Opht., 1928, v. 45, Sept., p. 562.

Two eyes, atrophied as a result of old injuries, were enucleated because of pain. In each a mass of bony material was found occupying the vitreous cavity. Microscopic examination showed marked proliferation of the ciliary epithelium and connective tissue and also of the connective tissue of the inner layer of the choroid. The retinas were detached and pushed forward. There was true ossification of portions of the proliferated connective tissue. There was no evidence microscopically of the vitreous. Thus what appeared microscopically to be ossification of the vitreous was shown to be ossification of the proliferated choroid and ciliary body lying under the detached retina. *M. F. Weymann.*

Hagedoorn, A. **The early development of the endothelium of Descemet's membrane, the cornea, and the anterior chamber of the eye.** Brit. Jour. Ophth., 1928, v. 12, Sept., p. 479.

The observations and conclusions contained in this excellent contribution are based on a study of specimens obtained from amphibians, vertebrates, and mammals. The human material was limited and insufficient to base definite conclusions. The animal Tarsius furnished the best series for study. The author's conclusions are: (1) The same principle governs the building up of the anterior segment of the eye in the whole vertebrate group. (2) The anterior segment of the eye is outlined at its first appearance by the ectoderm; the general scheme being more or less modified in the different species as follows: (a) Cornea: In the anterior vitreous a membrane is formed; the cornea primitiva, posterior to which the endothelium grows in as the first mesodermal element of the future cornea. Then the stroma cells grow in wedgewise between cornea primitiva and

epithelium. (b) Pupillary membrane: In the anterior vitreous an ectodermal membraneous cell-free pupillary membrane is formed: in mammals this membrane secondarily becomes cellular and vascularized. (c) Anterior chamber: The space between (a) and (b) is first filled up with the anterior vitreous or its substitute: only by its atrophy is the (real or virtual) anterior chamber formed. (3) The endothelium of Descemet's membrane is mesodermal epithelium. Ten photomicrographs accompany the contribution. *D. F. Harbridge.*

Halbertsma, K. T. A. **Some hereditary familial eye diseases.** Klin. M. f. Augenh., 1928, v. 80, June, 794.

The first genealogical tree represents a family with congenital familial degeneration of the yellow spot with color blindness, the second familial juvenile cataract, and the third familial congenital coloboma of the iris.

C. Zimmermann.

NEWS ITEMS

News items in this issue were received from Drs. C. A. Clapp of Baltimore, Ronald C. Moore of Philadelphia, G. Oram Ring of Philadelphia, and H. W. Wootton of New York City. News items should reach **Dr. Melville Black,** Metropolitan Building, Denver, by the twelfth of the month.

Deaths

Dr. H. Benson Wood, of Los Angeles, who was president of the eye and ear section of the county society, died suddenly of cardiac failure in the month of October.

George Edward Wherry, aged seventy-six years, of Cambridge, England, one of the original members of the Ophthalmological Society of the United Kingdom, died recently at the age of seventy-six years.

Miscellaneous

The Mississippi state health officer, Jackson, has issued a warning to the public against peddlers of glasses who claim to be connected with the Mississippi State Commission for the Blind. The Commission has not authorized anyone to sell or give away glasses in its name.

In "Gesta regum anglorum" ("Deeds of the English Kings"), William of Malmesbury, writing in Latin, described William Rufus, second Norman king of England, in such terms as to indicate that he had heterochromia iridis (British Journal of Ophthalmology).

An interesting illustration of the fact that medical ethics vary greatly with locality appears in a professional advertisement on the back cover page of the "Italian" Annali di Ottalmologia. This advertisement, occupying three-fourths of the large cover page, reproduces a florid newspaper report of the wonderful cures effected by a certain oculist in a proprietary institution; the headlines being "Audacities and victories of surgery: another blind person restored to light." It is interesting to note that one of the previous unfavorable consultations which the patient is said to have undergone was with Professor Cirincione of Rome, the editor of the journal in which the advertisement appears.

The following story of the punishment meted out in Persia, "once upon a time," to an oculist whose claims were greater than his ability, is quoted by the Annali di Ottalmologia from the author Ughetti. Coming from another country to Persia, the oculist in question was visited by five magnates, who contracted with him that if by his operations they obtained their sight they would pay him liberally, while in the opposite case they would cut off his right hand. He blinded all five of them and each one laid claim to the hand. The governor issued a decree that, since the same hand could not be cut off five times, the contract was not capable of execution. But, considering that the oculist was native of a country with which Persia was always at war, the governor sentenced him to go and practice ophthalmology in his own country, judging that by the practice of his art the enemy would receive no less harm than a Persian army could have inflicted.

Annali di Ottalmologia seriously states that the consumption of wood alcohol resulting from prohibition in the United States has created a serious problem in Italy. by the consequent great frequency of optic atrophy among returning Italian emigrants! The journal further remarks that wine was created with man, and that recent researches seem to indicate that Eve was not corrupted by an apple but by a bunch of grapes!

Dr. Dohrmann K. Pischel writes that his paper on glaucosan therapy in glaucoma has led to several inquiries as to where glaucosan can be obtained in the United States. The drug can be had from Tretchmar, at 396 Broadway, New York City.

Omission: From the list of physicians certified recently by the **American Board for Ophthalmic Examinations,** which was published in the September isue of the American Journal of Ophthalmology, the name of Dr. John Shaffer Plumer of Philadelphia was inadvertently omitted.

The Cambridge Instrument Company, Limited, of London, England, represented in the United States by the Çambridge Instrument Company, Incorporated, New York City, ask us to state that they, and not Messrs. Heath of London, are the makers of the Salomonson photographic ophthalmoscope used by Dr. Margaret A. Dobson in connection with the study of red-free light of which a description was published in the June issue of the American Journal of Ophthalmology, page 431.

Societies

The Chicago Ophthalmological Society was addressed, October 22, by Dr. Percival Bailey on "Angiomatosis of the central nervous system."

The National Society for the Prevention of Blindness and the American Association of Industrial Physicians and Surgeons held a joint session, November 26, at the Russell Sage Foundation Building, New York.

The program of the St. Louis Medical Society, October 16, was given under the auspices of the American Academy of Ophthalmology and Otolaryngology. Dr. Allen Greenwood of Boston spoke on "Relation of the eye to general disease."

The Council of the American Academy of Ophthalmology and Otolaryngology presented Miss McGovern with a Ford automobile in recognition of the very efficient services she has rendered as secretary to Dr. Wherry. It is rumored that she was "tickled pink."

The Section on Ophthalmology of the College of Physicians of Philadelphia, for October 18, presented an interesting program in which Drs. M. E. Marcov, Burton Chance, Edward A. Shumway, H. Maxwell Langdon, H. M. Cobe, George E. deSchweinitz, and G. Oram Ring took part. At the meeting held November 15, the program was given by Drs. G. H. Cross, H. W. Scarlett, W. O. LaMotte, John Siggens, William Zentmayer, T. B. Holloway, Perce DeLong, and Burton Chance.

The Hungarian Ophthalmological Society has elected the following honorary members: T. Axenfeld (Freiburg i. Br.), E. Krückmann (Berlin), A. Siegrist (Bern), Arnold Knapp (New York), and Treacher Collins (London).

The report of the eighteenth annual meeting of the Oxford Ophthalmological Congress (British Journal of Ophthalmology) mentions, as an interesting feature of this successful annual gathering of ophthalmic surgeons, the fact that each member of the congress is assigned rooms in Keble College and becomes for the time being a student of the college. Practically no members from abroad attended the congress this year, probably owing to the fact that the International Congress of Ophthalmology will meet at Amsterdam in 1929.

Personals

Dr. Herbert W. Wooton, of New York City, anounces the removal of his office to 105 East Sixty-third Street.

Dr. Carl Fisher, of Los Angeles, has moved his office from the Pacific Mutual Building to the new Wilshire Medical Building at 1930 Wilshire Boulevard.

The office of Dr. Theodore Lyster has been moved to the fourteenth floor of the Wilshire Medical Building, Los Angeles.

Dr. L. Webster Fox, of Philadelphia, has mailed us "Reports of eye clinics, session 1927-1928, hospital of the Graduate School of Medicine, University of Pennsylvania." Two hundred and ninety operative cases are reported, including fifty-eight cases studied with the slit-lamp. Dr. Fox has a very clear way of reporting his operative technique. His writing reminds one of the very skillful use of his hands.

Dr. Henry N. Blum, of New Orleans, is abroad and will not return to his home until January.

Dr. G. Weill of Strassburg was a recent visitor at the Wilmer Clinic.

Dr. Ronald C. Moore of Philadelphia announces the opening of an office at 1530 Locust Street.

Dr. Park Lewis of Buffalo has been in Baltimore inspecting the Wilmer Clinic.

Dr. Haywood Taylor has been engaged to do research work in chemistry at the Wilmer Institute.

On October 12, Dr. William H. Wilmer read a paper on "Diseases of the eye in old age" before the New York Academy of Medicine.

Sir John Parsons has been appointed a member of the Medical Research Council of Great Britain.

Dr. W. Beaupré of Quebec, Ontario, recently had the satisfaction of performing a successful cataract operation on his ninety-four-year-old mother.

American Board for Ophthalmic Examinations

The American Board for Ophthalmic Examinations held its twenty-eighth examination at the Washington University Dispensary, St. Louis, Missouri, beginning 9:00 a.m., Monday, October 15, 1928. The examination was in charge of Dr. Allen Greenwood, chairman of the Committee on Examinations, and twenty-three candidates presented themselves.

Through the courtesy of Mrs. Teresa Neuberger, head of the Social Service Department and the cooperation of Drs. M. Hayward Post and William McKim Marriott, dean of the Washington University Medical School, ample facilities and material from the Social Service Department were provided for carrying on the examination.

The following members of the Board were present and conducted the examination of the candidates:

Dr. E. C. Ellett, president
Dr. William H. Wilder, secretary-treasurer
Dr. Allen Greenwood
Dr. James M. Patton
Dr. John M. Wheeler
Dr. Walter R. Parker
Dr. William H. Crisp

They were assisted by Drs. S. J. Beach, William L. Benedict, Conrad Berens, William C. Finnoff, William F. Hardy, Harvey D. Lamb, Walter B. Lancaster, Grover H. Poos, F. O. Schwartz, Charles W. Tooker, and Meyer Wiener.

As usual, the practical oral examination included the following subjects:

External diseases
Ophthalmoscopy
Pathology and anatomy
Refraction
Ocular muscles
Perimetry
Relation of eye to general disease
Therapeutics and operations

The written examination was held in the afternoon on the following questions:

1. Describe the distribution of the nerve fibers in the retina after leaving the optic disc. How may this affect the field defects of chronic glaucoma?

2. Transpose these lenses: Sph. +4.50, cyl. —3.50 axis 40°. Cyl. —2.50, axis 180°, cyl. —1.75, axis 90°. Describe how a ray of light is altered on passing through a prism and illustrate by diagram.

3. Cause, treatment, and prognosis of serpiginous ulcer of the cornea.

4. Differentiate Parinaud's conjunctivitis.

5. (a) What ocular findings might you expect from a tumor pressing on the right optic tract? (b) How would the central and peripheral vision be affected?

The Board held its executive session in the evening at the Statler Hotel, and granted its certificates to the following doctors, who had satisfactorily passed the requirements and examinations:

Ellice Murdoch Alger, New York City
Daniel Herbert Anthony, Memphis, Tennessee
Alvin Julius Baer, Kansas City, Missouri
William Mathews Bane, Denver
George Huston Bell, New York City
Eugene Loring Bulson, Fort Wayne, Indiana
Leon Clinton Combacker, Fergus Falls, Minnesota
Lloyd Glenn Dack, St. Paul, Minnesota
Harry Benjamin Davis, Kansas City, Missouri
Perce DeLong, Philadelphia
Oscar Dodd, Evanston, Illinois
Maurice Lytton Green, St. Louis
Norman Darrell Harvey, Providence, Rhode Island
Charles Hobart, St. Louis
William Asa Hoffman, Chicago
Charles Andrew Hofling, Jr., Cincinnati
Albert Hooss, St. Louis
Charles Hymes, Minneapolis
Theodore S. Kammerling, Chicago
William A. Kennedy, St. Paul
Arnold Knapp, New York City
Hugh Alva Ross Kuhn, Hammond, Indiana
Roy Earl Mason, St. Louis
Robert John Masters, Indianapolis
Clarence Wager Rainey, Chicago
Frank Henry Rosebrough, San Antonio, Texas
David Howard Shaffer, Pittsburgh
James Melville Shields, Denver
Earl Terry Smith, Hartford, Connecticut
William Francis C. Steinbugler, Brooklyn
William Shakespeare Summers, Detroit
James Thorington, Philadelphia
Lloyd Bankson Whitham, Baltimore
Samuel Wolf, Chicago

The Board will issue a supplementary list of persons who have been certificated since the publication of its directory. This list when completed will be sent gratis to all purchasers of the directory.

Dr. John M. Wheeler was elected by the American Academy of Ophthalmology and Otolaryngology as its representative on the Board for three years beginning January 1, 1929. The next examination of the Board will be held at Portland, Oregon, at the time of the meeting of the American Medical Association.

WILLIAM H. WILDER
Secretary
122 South Michigan Avenue, Chicago

SUPPLEMENT to the AMERICAN JOURNAL of OPHTHALMOLOGY
Series 3, Vol. 11, No. 11 November, 1928

BIOMICROSCOPY OF LENTICULAR OPACITIES

BY

L. W. MORSMAN, M.D., F.A.C.S.
HIBBING, MINNESOTA

With fifty-six illustrations

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Graduate School of Medicine, University of Minnesota.
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BIOMICROSCOPY OF LENTICULAR OPACITIES

L. W. Morsman, M.D., F.A.C.S.
HIBBING, MINNESOTA

Microscopic study of the cornea of the living eye has been possible in a limited manner for many years with the use of the Czapski binocular corneal microscope. On account of poor lighting of the tissue, however, work was not practical until Alvar Gullstrand perfected the slit-lamp. The ingenious combination of these two instruments, as worked out by Professor Henker of the firm of Carl Zeiss, allows the oculist to study the anterior third of the living eye under low power magnification (9 to 103 diameters) quite as readily as sections could be studied in the laboratory and with the added advantage of observing the ever changing pathology.

The term "biomicroscopy", here used in accordance with the suggestion of Dr. Edward Jackson[1], gives to this new field in ophthalmology a name worthy of the subject.

Lenticular opacities

The principal discussion in this thesis will be concerning the biomicroscopic appearance of lenticular opacities. Observations were made of all available cases of cataract coming to the clinics of the University of Minnesota from October 1, 1924, to June 11, 1925, and of the University of Vienna from October 1, 1926, to March 1, 1927. Selection of representative types was made, and from these original drawings and descriptions were taken. The group of selected cases thus obtained was then made the basis of this study. Any rare types omitted, therefore, were not available to the writer during those two study periods.

Literature

The literature of the general subject has already become voluminous, and testifies to the intense interest taken in this comparatively new field by the oculists of the whole world. There are already several books published, and about a hundred monographs. Literature pertaining to lenticular opacities is not so abundant. Vogt[2] has without doubt given the subject its best treatment in his chapter on the pathological lens in his well known text. The substance of Vogt's monographs [3, 4, 5, 6, 7, 8] dealing with the pathological lens is condensed and included in his textbooks.

Koeppe[9, 10] likewise has made many references to the pathological lens, the substance of which he publishes in text. Koby[11] has written a most interesting little book wherein he gives considerable detail concerning the pathologic lens. He[12, 13] also gives monograph case reports of his observations of hereditary types. In the Doyne Memorial Lecture given before the Ophthalmological Congress in 1924, Butler[14, 15] gave a most interesting series of illustrative drawings of normal and pathological lenses. Among a series of illustrations Bedell[16] has given a number of drawings of cataracts as seen by him with the use of the slit-lamp and corneal microscope. In a monograph Hasny[17] takes up the diagnosis of beginning cataract, while Rollet[18] and coworkers give the results of their observations of senile cataract. Horvath[19] gives his observations of cataract after influenza, while Schnyder[20] reviews his observation and examination of diabetic cataract. Electric cataract has been reported on by Frese[21], Gjessing[22], Becker[23], and Koeppe[24], while others who have given case reports are Von der Heydt[25] on coronary cataract, Jess[26] on copper cataract, Löwenstein[27] on cataract with neurodermitis, and Meesmann[28, 29] on water-slits in the lens and on cataracta cœrulea.

Technique

The method of examination and use of instruments will not be discussed here. Reference is made to the thorough explanation of technique and use of instruments by Koeppe[9, 10], Vogt[2], and Graves[30, 31, 32]. The makers put out a number of pamphlets on the instruments. This material has been well reorganized into good readable form by Bedell[33]. For the proper visualization

of any discussion of biomicroscopy of the lens it is necessary to bear in mind the magnification and field. The present study was made with the five following magnifications:

Ocular	Objective	Magnification times	Field
4	0.55	16	8.5 mm.
2	A_2	23	5.0 mm.
2	A_3	25	3.3 mm.
4	A_2	40	3.3 mm.
4	A_3	41	2.2 mm.

When one notes that the magnification of 41 times gives a field of only 2.2 mm. it can be readily understood that a lens 4 by 9 millimeters cannot be illustrated except by successive drawings. Furthermore, when looking at a lens opacity with such a field we find that only the center of the field is distinct. Thus an optical section represents a series of drawings, so that the term composite drawing will be used frequently in this discussion.

Drawings

All drawings and illustrations were made by the author and, not being an artist, he begs indulgence as to technique. As so few artists have as yet been trained in slit-lamp technique, they can not see what the oculist sees. Again, not having been trained as oculists, their interpretation is likely to be fanciful. The figures illustrating the text were made with the main object in view of producing a clinical picture that would best help the beginner to know what to see. Exact mathematical drawings representing the magnification have not been attempted. Both anterior views and optical sections were first sketched in toto with magnification sixteen times and then detail added under the magnification given in the legend under the figure. For example, in figure 1 of the normal lens the phantom of the optical section was first drawn with ocular 4, objective 0.55, magnification sixteen. Then with light bundle and patient's eye remaining fixed, the detail was added through successive focusing with ocular 4, objective A3, magnification forty-one. In a few drawings (figures 3, 16, 20, 50, and 52) it was found a better clinical picture could be produced by drawing in larger opacities under low power. This gives the effect of opacities crossing from one zone to another (clinical picture). In the legends under the above figures caution is added that such linear opacities should be interpreted as perpendicular to the plate.

In the usual routine examination while making drawings of the eye, the slit-lamp is handled with the left hand and the bundle of light seen as coming from that side (patient's right). Thus one may work faster by using the left hand for slit-lamp control (passing the light bundle across the patient's nose when necessary), and having the right hand free for sketching. The work is also greatly facilitated by having the drawing lamp switch under foot control.

Classification of cataract

No new classification of lens opacities will be suggested but that found in the last Fuchs's textbook of ophthalmology will be followed as far as possible in the presentation of cases. Terms not found in standard textbooks, but which have come into common use as a result of biomicroscopy, will be used. Fuchs's classification of lenticular opacities follows:

Classification of opacities of the lens (cataract)

I. Clinical classification
  A. Partial stationary cataract
    1. Anterior polar cataract
    2. Posterior polar cataract
    3. Circumscribed opacities of other types
      a. Fusiform cataract
      b. Punctate cataract
    4. Zonular (perinuclear or lamellar) cataract
    5. Cortical cataract, anterior and posterior
  B. Progressive cataract
    1. Incipient cataract
    2. Intumescent cataract
    3. Mature cataract
    4. Hypermature cataract
II. Etiological classification
    1. Congenital cataract
    2. Senile cataract
    3. Cataract due to general diseases and toxic conditions
      a. Diabetes
      b. Tetany

c. Other convulsive diseases
d. Poisons
4. Traumatic cataract
5. Complicated cataract

The Normal Lens

Before taking up the microscopic appearance of cataract, let us first consider the appearance of the normal structure. Figure 1 represents an optical section of the right eye of an emmetropic female patient thirty years of age. The head was fixed and the eyes looking straight forward at a six mm. electric globe at six meters. The slit-lamp bundle, reduced to 0.25 mm., was brought into the pupillary center of the lens (pupil dilated with cocaine). Angle of light bundle not more than five degrees to patient's right. Microscope fifteen degrees to patient's left. Phantom of lens drawn under magnification sixteen times and detail under forty-one times. A slight lateral movement of light was used to bring the embryonal sutures into view.

The classification of the surface of separation as suggested by Vogt[34] will be used. Numbers 1 and 10 (figure 1) are respectively the anterior and posterior lens capsule. The darker line between numbers 1 and 2 represents the area of contact—"niveau line"—between the capsule and the lens. This is also called the anterior band of disjunction. There is, of course, such a line between the posterior border of the lens and the lens capsule—the posterior band of disjunction. Numbers 3 and 8 show the greater reflection of light normally found at the junction of the cortex and the senile nucleus. Numbers 4 and 7 show secondary embryonic nuclear surfaces (sometimes called the presenile surfaces), while 5 and 6 outline the anterior and posterior borders of the em-

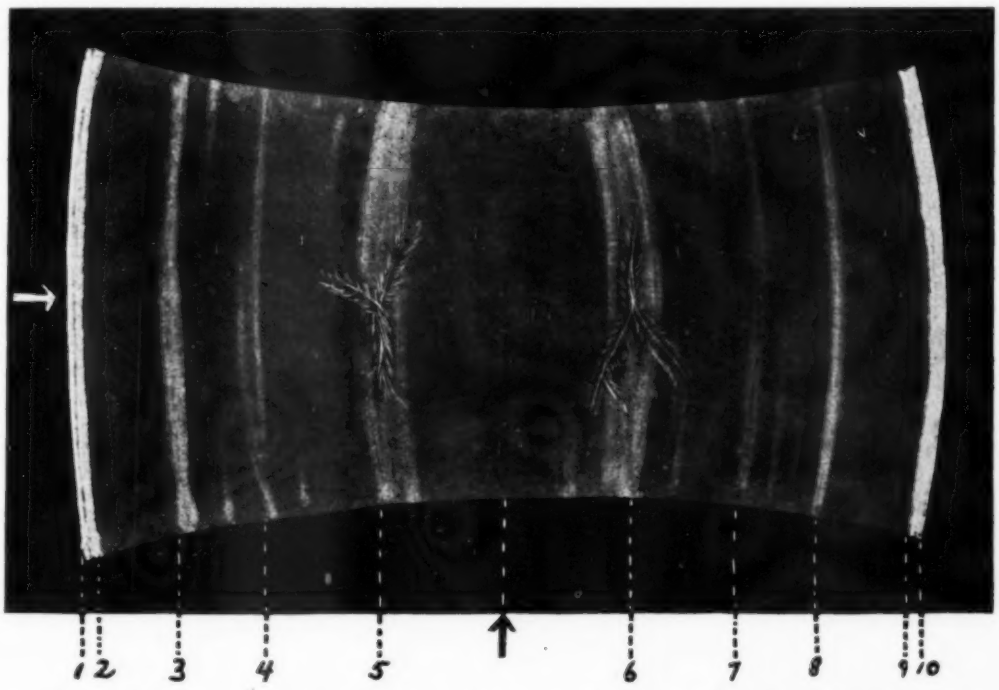

Figure 1. **Normal adult lens.** Optical section through center in median line. White arrow indicates direction of light bundle. Nos. 1 and 10 indicate anterior and posterior lens capsules. Dark shadow lines between 1 and 2, also 9 and 10, indicate the anterior and posterior bands of disjunction. Nos. 3 and 8, junction of cortex and senile nucleus. Nos. 4 and 7, secondary embryonic nuclear surfaces. Nos. 5 and 6, anterior and posterior borders of the embryonic nucleus. In the reflecting surface 5 is the anterior erect Y of the embryonic suture. In surface 6 is the posterior inverted A of the embryonic suture. Black arrow indicates center of anteroposterior diameter of lens. Surfaces of reflection —nos. 1 to 10—are zones of discontinuity. Oc. 4. Obj. A_2. Mag. x 41.

bryonic nucleus. In the reflecting surface 5 is the anterior erect Y of the embryonic suture, and in 6 the inverted Y of the posterior embryonic suture. These surfaces are usually quite constant in the adult. Very often many more are found, and occasionally, especially in the lens of old age, there are so many surfaces that the appearance of the optical section has been likened to that of a halved onion. In the senile lens also, due to sclerosis, we find more light reflected, so that the entire lens appears much lighter in color. The black vertical arrow in the figure represents the lens center, while the white horizontal arrow represents the direction of the entering bundle of light from the slit-lamp. This bundle is always adjusted to as narrow a band as possible when detail (under high magnification) and depth are required.

Koby[38] and others have recently been referring to the surfaces of reflection as zones of discontinuity. On account of usage these terms will also be used at times in description.

Anterior polar cataract
Diabetic cataract

Case no. 34207*. Figures 2 and 3, drawn February 24, 1925, illustrate an anterior polar cataract of long standing complicated by a diabetic cataract of more recent duration. This patient, Mr. A. I. A., aged forty-six years, married, salesman, has been under observation at the university for a number of years.

Family history negative. Gives history of "sore eyes" when a child but thought eyes were normal until, in his early twenties, he accidentally discovered that vision in the right eye was poorer than in the left. An oculist whom he consulted at this time told him there was a "small spot" in his right lens which caused the lowered vision, and advised no treatment. With this history and from the fact that microscopic examination shows fine scarring in the center of the right cornea, it may be inferred that the polar cataract is secondary to perforating ulcer of the cornea in childhood. It may be noted from the drawing that there is a small capsular cataract as well, with sufficient protrusion to bring it under the classification pyramidal cataract.

This patient contracted pulmonary tuberculosis for which he was confined in a tuberculosis sanatorium in 1922. During that year he had a detachment of the retina of the left eye which was thought to be secondary to tuberculosis infection. Two years ago he reported at the dispensary for physical examination, at which time an additional diagnosis of diabetes was made. During the two years following, some further clouding of vision was noted by the patient in the right eye.

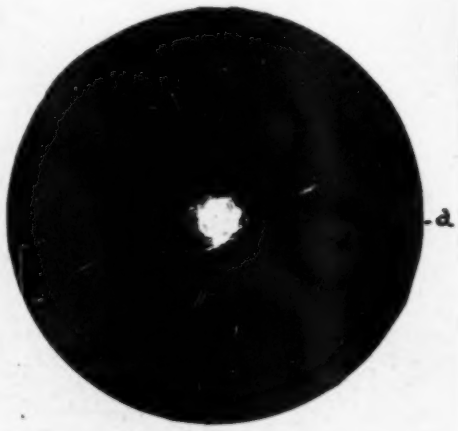

Figure 2. Case no. 34207. (Same eye as in figure 3.) **Anterior polar cataract. Diabetic cataract.** Composite opaque area represents the anterior polar cataract. Radiating opacities were later caused by diabetes. a, area of iris margin. Oc. 2. Obj. A_2. Mag. x 23.

Examination on February 25, 1925, showed: O. D. V. 1/6. Negative except lens (figs. 2 and 3). O. S. V. Nil. Complete detachment of retina.

Physical examination: Temperature 96.8°, pulse 74. Weight 160 pounds. Few small mucous râles in left apex which persist with cough. Feels well. Appetite good. Sleeps well. Urine: acid, sp gr. 1026, alb. neg. Few leukocytes and hyaline casts. Blood sugar 0.155. In view of the proportion of lens

* Case histories are given only in brief. All detail not related to the general subject will be omitted. All cases not otherwise specified are from the clinics of the University of Minnesota.

opacities with diabetes, the similarity to other diabetic cases, and the fact that further lowering of vision came with diabetes, this case has been given a secondary diagnosis of diabetic cataract. (See also diabetic cataract case no. 493387).

The differential diagnosis between senile cataract and diabetic cataract of the adult and based upon microscopic examination alone may be outlined as follows:

Senile cataract:

1. Approximately eighty per cent of opacities confined to the cortex.
2. Likely to be spoke formation with beginning water-slits.
3. Opacities are laid down along the surfaces of separation.
4. Intermediate areas likely to be fairly clear.

Diabetic cataract:

1. Opacities fairly evenly divided throughout lens.
2. Spoke formation and water-slits not likely present.
3. Opacities take form of radiating lines outside of surfaces of separation as well as increased density of surfaces.
4. Intermediate areas are likely to have a pale milky cast.

Anterior polar cataract

Case no. 5683–1922*. Mrs. M. W., aged twenty-eight years, who has been under treatment at the university clinic for two years past, reported for observation on February 22, 1927, at which time the studies represented by figures 4 and 5 were made.

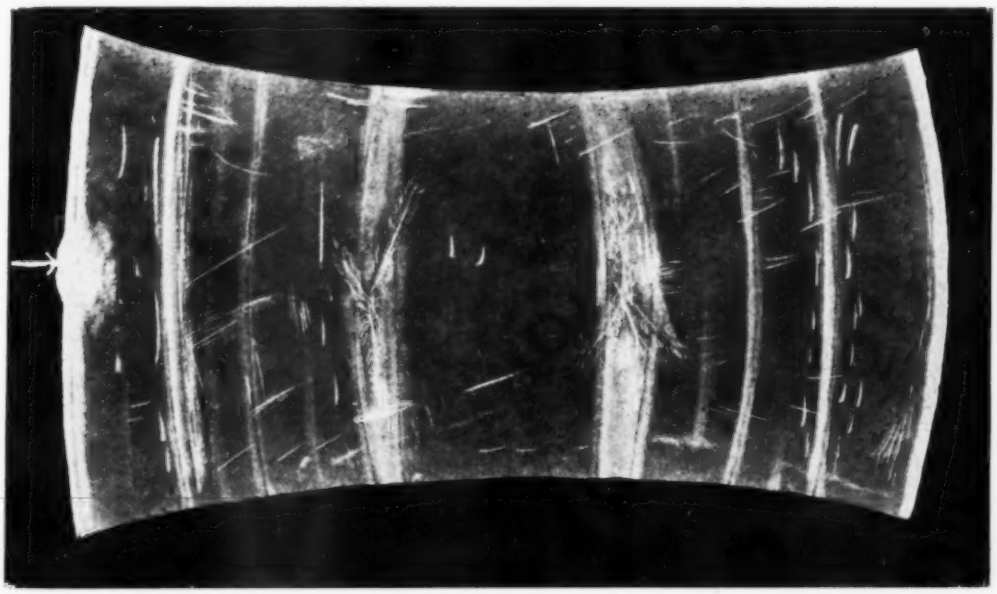

Figure 3. Case no. 34207. (Same eye as in figure 2.) **Capsular cataract. Anterior polar cataract. Diabetic cataract.** Composite drawing of optical section of right lens. Arrow points to anterior polar cataract, also indicates direction of light bundle through lens. Opacities in body of lens are secondary to diabetes. Opacities which appear to cross from one surface of separation to another are to be interpreted as parallel to zones. Oc. 4. Obj. A_2. Mag. x 40.

Family history negative. Personal history negative except lues two years ago (Wassermann now negative after

* The author wishes to thank the oculists of the University of Vienna for their cooperation in the study of cases represented by figures as follows:

Augenklinik 1, Meller:

Assistant Dr. J. Urbanek: figs. 4. 5. 11. 12. 28, 29, 30, 31, 41, 42, 43, 44, 45, 46, 48, and 49.

Dr. Bertha Klein: figs. 37, 38, 39 and 40.

Augenklinik 2, Dimmer:

Docent Dr. G. Guist: figs. 6 and 55.

Assistant Dr. A. Pillat: figs. 13, 14, 33, 34, 35 and 36.

Assistant Dr. G. Sallmann: figs. 21 and 22.

treatment) and lowered vision in left eye. Patient stated there had always been a "white dot" in it.

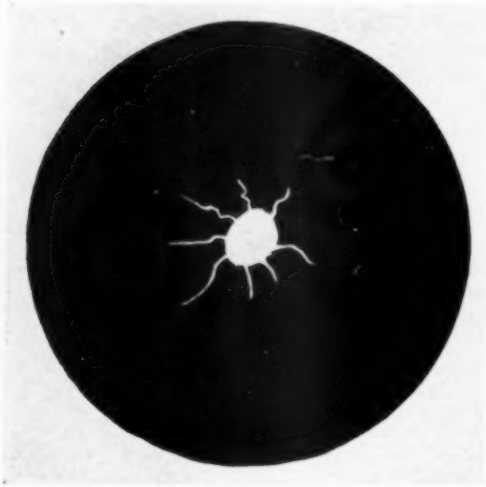

Figure 4. Case no. 5683–1922. (Same eye as in figure 5.) **Anterior polar cataract.** Composite anterior view of right lens with focal illumination. Central opaque area represents anterior polar cataract. Radiating lines of opacities extend out along capsule. Inner margin of black circle represents pupil. Oc. 2. Obj. A_3. Mag. x 35.

Eye examination: O. D. V. 6/6. O.S.V.6/30. Right eye negative. Left eye negative except for central lens opacity.

Microscopic examination of central anterior surface of left lens showed a nearly round opacity involving the capsule and extending slightly into the cortex. Total area extended slightly into anterior chamber. Eight radiating wavy linear opacities extended outward in the plane of the capsule (fig. 4). Immediately beneath was a corresponding smaller opacity without radiating lines situated in the senile surface of separation (fig. 5). This picture indicates that the pathological process took place before the cortex was formed. Later, as the cortex developed, the cataractous area was separated by the growth of the cortex until now the opacity is partly on each of the two surfaces. This was probably about or shortly after birth. The integrity of the embryonic nucleus, the history of the case, and the nonpresence of congenital remnants speak against a congenital origin of this cataract.

Anterior polar cataract
Senile cataract

Case no. 44–102–122. F. M., a man fifty-one years of age, reported to the clinic for cataract operation on February 21, 1927, on account of vision that had become so poor he was no longer able to get about.

There was no family history of eye anomalies. The patient stated that all members of his family had good vision, but that he had had poor vision all his life. As a young man he had learned the shoemaker's trade which he had followed until three years ago, when further lowering of vision prohibited work.

Eye examination: O. D. V. light projection. With pupil dilated with cocaine, patient could count fingers at two meters. O. S. V. counts fingers at one meter, with dilated pupil two meters. External examination negative for age except lenses. In each eye the lens projected forward into the anterior chamber to the extent of one-fourth the depth of the latter. The apex of each cone or pyramid presented a flat

Figure 5. Case no. 5683–1922. (Same eye as in figure 4.) **Anterior polar cataract.** Optical section through anterior portion of left lens. b, anterior capsule with anterior polar cataract showing in center: note position of radiating lines in section and compare with figure 4. a, senile surface of separation with lens opacity immediately behind the first. c, iris margin. Oc. 2. Obj. A_3. Mag. x 35.

rounded eminence more dense than the surrounding tissue. Both lenses were entirely cataractous (senile). The capsules were lifted into slightly twisted

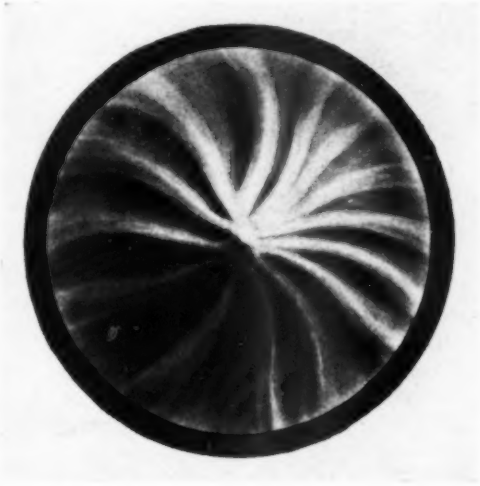

Figure 6. Case no. 44–102–122. **Anterior polar cataract. Senile cataract.** Composite anterior view of right lens with focal illumination. Area in center projected forward one-fourth the depth of the anterior chamber. Radiations are folds in the lens capsule. Entire lens cataractous. Black circle indicates position of iris. Oc. 2 Obj. A_3. Mag. x 35.

and radiating folds which had the same number (fourteen) and similar disposition in each eye. A drawing was made of the right eye (fig. 6) with the pupil moderately dilated.

From the study of this case it would seem to be one of congenital anomaly. The fact that both eyes were just alike would speak against accidental cause during infancy. The negative family history likely means nothing in this case. This may be an unusual type of hereditary anterior polar cataract, which is known to be transmitted as a dominant Mendelian character, due to an error of development originating toward the end of intrauterine life.

Posterior polar cataract

Case no. 46460. W. B., a boy eight years of age, was referred to the refraction clinic on April 20, 1925. He has been under the observation and treatment of the department of pediatrics on account of simple anemia. As the boy had some headache it was deemed advisable to eliminate refractive error as a possible cause.

Examination of the eyes showed: O. D. V. 6/7, O. S. V. 6/6. External examination as well as fundus was negative in either eye, with the exception that a small white dot was seen with the ophthalmoscope while examining the fundus of the right eye. This appeared to be on the posterior central portion of lens and was diagnosed as posterior polar cataract. Refraction showed no error of moment.

The microscopic examination was most interesting and is shown in figure 7. About the optical center of the lens at "a" may be seen persistent remnants of the tunica vasculosa lentis which cause the slight lowering of vision. This could not be seen by other methods of examination. The case is quite similar to one reported by Gifford[36]. It is most likely that many of the posterior polar cataracts of the older medical literature were of this congenital type. Vogt[37] has shown that microscopic remains of the tunica vasculosa lentis are quite common.

Punctate cataract

Case No. 35534. Mrs. P. W., aged forty-five years, came to the dispensary

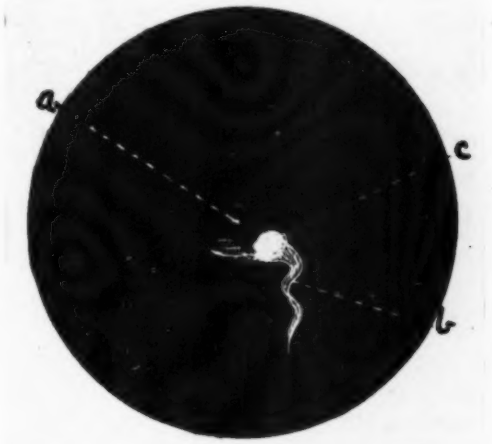

Figure 7. Case no. 46460. **Posterior polar cataract.** Composite view posterior to right lens showing hyaloid membrane. a, optical center obstructed by opacity. b, hyaloid remnant projecting back into vitreous. c, normal area for attachment of remnant. Oc. 2. Obj. A_2. Mag. x 23.

January 24, 1925. She gave a negative personal and family history, but complained of greater difficulty in doing her sewing for the past few months. Vision was 5/6 in each eye. On account of history and negative external examination the patient was referred to the refraction clinic. During the routine fundus examination fine white dots were found in each lens (see figure 8). Further questioning of the patient still resulted in an entirely negative history. She has not been aware of any eye abnormality either in herself, her children, or her parents. Her distant vision was unimproved with glasses, and reading vision of Jaeger 75 was obtained in each eye with +1.00 sphere at 33 cm.

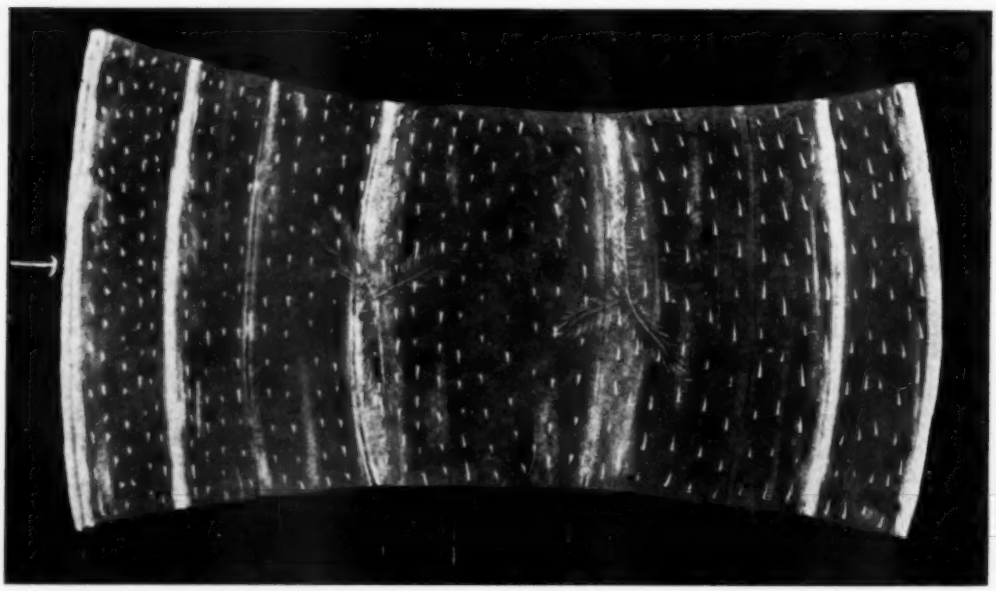

Figure 8. Case no. 35534. **Punctate cataract.** Composite drawing of optical section of right eye. Arrow indicates anterior surface and direction of light bundle. Note fine punctate opacities throughout entire lens. Congenital cataract. Oc. 4. Obj. A_2. Mag. x 40.

The very interesting picture obtained in optical section with the microscope is of punctate cataract, and, judging by the appearance, the condition is no doubt congenital. Most cases of this type have the same appearance, but with the cortex clear. The fine punctate opacities in this lens, when examined with ocular 6 and objective A_2 (x67), appeared to be small vacuoles. While one is viewing these opacities under magnification, it seems quite remarkable that the patient could have vision of 6/7. This type of lens opacity may be due to impairment of lens nutrition (toxemia?) throughout embryonic and adult life, or there may be a congenital predisposition to this lens structure.

Zonular (perinuclear or lamellar) cataract

Case no. 54480. Mr. F. C. S., age thirty-seven years, reported at the dispensary on January 27, 1925.

Examination showed: O. D. V. 6/12. External examination negative except fine lens opacities. Fundus fairly well seen and negative. (For O. S. see "after cataract" and figure 56.)

The patient was refracted under homatropine and no refractive error of consequence was found. The opacities in the right eye were diagnosed as zonular cataract.

Figure 9 shows a microscopic drawing of the cataract with the pupil widely dilated. The cortex was clear and the nucleus sharply circumscribed. Figure 10 illustrates an optical section of the

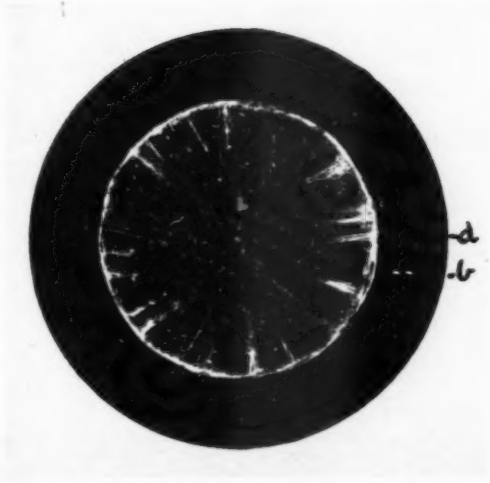

Figure 9. Case no. 54480. (Same eye as in figure 10.) **Zonular (perinuclear or lamellar) cataract.** Composite anterior view of right lens. a, dilated margin of pupil. b, clear cortex. Opaque area represents nucleus of lens. Oc. 2. Obj. A_2. Mag. x 23.

same lens. It is here interesting to notice that the nucleus has punctate opacities (brought out only by this method of examination), further evidence being thus added as to the congenital nature of this cataract.

The disposition of opacities in Figure 10 can hardly be said to be typical of zonular cataract. The more opaque area will most often border on the embryonal surfaces of separation and the lens become less cataractous outward to the senile surfaces.

Coronary cataract
Dust-like cataract

Case no. 600–1921. L. W. a man aged twenty-one years came to the refraction clinic on account of subnormal vision tests. A definite history could not be obtained, but the patient stated that he had always had rather poor vision. There was no other complaint.

Eye examination: O. D. V., 6/24 O. S. V. 6/18. External examination negative in both eyes. Refraction: O. D. −2.00 cyl. ax. 20°, V. 6/8. O. S. −1.75 cyl. ax. 10°, V. 6/8. During examination fine opacities were noted confined to the nucleus of either eye. Eye grounds negative.

Microscopic examination of the opacities showed fine powder-like spots

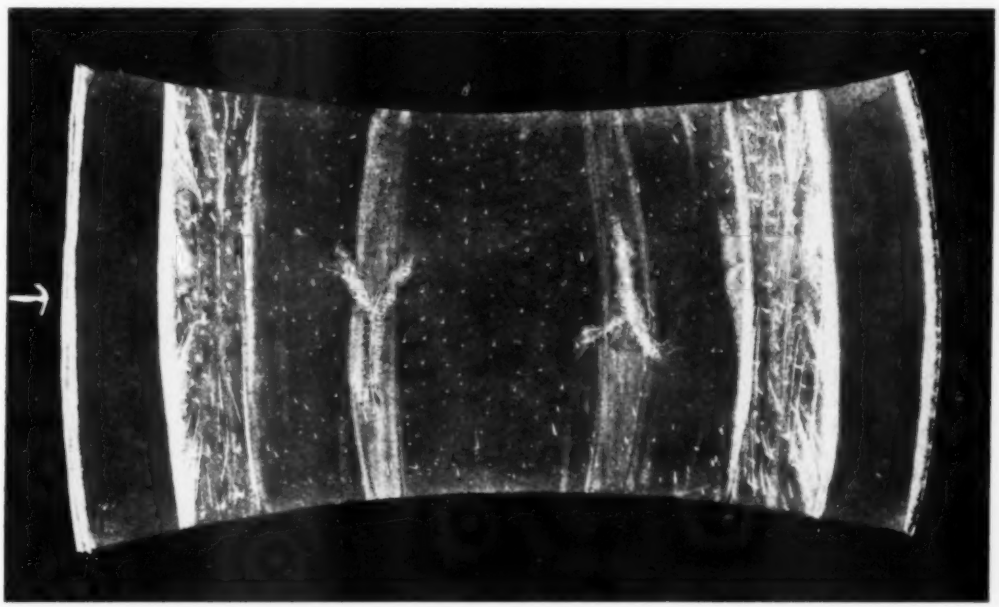

Figure 10. Case no. 54480. (Same eye as in figure 9.) **Zonular (perinuclear or lamellar) cataract.** Composite view of optical section. Arrow indicates anterior surface and direction of light bundle. Note fine punctate opacities in embryonal section (congenital) and denser opacities nearing cortex. Oc. 4. Obj. A_2. Mag. x 40.

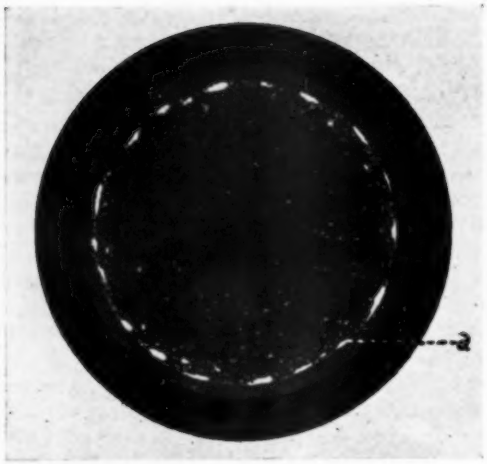

Figure 11. Case no. 600–1921. (Same eye as in figure 12.) **Coronary cataract. Dust-like cataract.** Drawing of cross section of lens through center under focal illumination. a, margin of senile nucleus showing plaques of coronary cataract. Inner portion shows fine punctate opacities while outer zone is clear normal cortex. Oc. 2 Obj. A_2. Mag. x 23.

throughout the lens, with the exception of the cortex. On the senile surface of separation and lying just within it were larger plaque-like opacities of a slightly developed coronary cataract. Figure 11 shows a drawing of the right eye made under focal illumination while figure 12 gives the disposition of the opacities as shown in optical section. This type of cataract is most often of such density that surfaces of separation and embryonal sutures cannot be seen in optical section.

Coronary cataract
Cataract of senile sutures

Case no. 661—1923. Mrs. F. G., aged twenty-eight years, first came to the Dimmer clinic in 1921. From that time until early in January 1927, her lens pictures have remained unchanged. Patient gives no history of eye trouble in her family. Her own history is unimportant. She does not recall any eye trouble in childhood.

External examination negative except lenses. Eye grounds negative. Refraction: O. D. −1.00 sph. −0.75 cyl. ax. 20°, V. 6/7; O. S. −3.00 cyl. ax. 20°, V. 6/30.

The microscopic examination of the

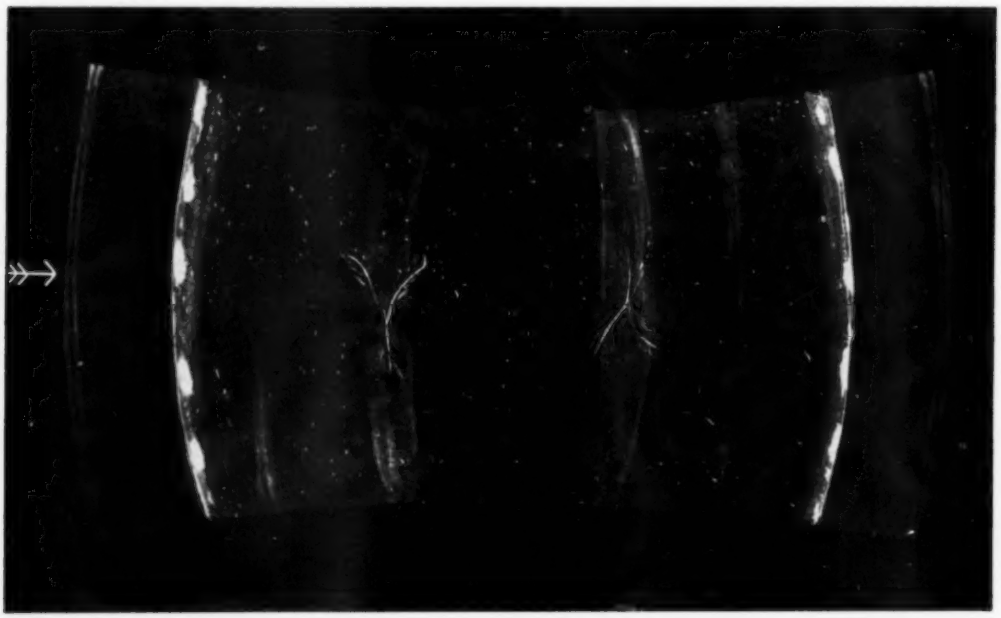

Figure 12. Case no. 600–1921. (Same eye as in figure 11.) **Coronary cataract. Dust-like cataract.** Drawing of optical section through right eye. Arrow indicates anterior lens surface and direction of light bundle. Large plaque-like opacities of coronary cataract shown on anterior and posterior bands of adult nucleus. Fine opacities throughout nucleus. Probably congenital in origin. Oc. 2. Obj. A_2. Mag. x 23.

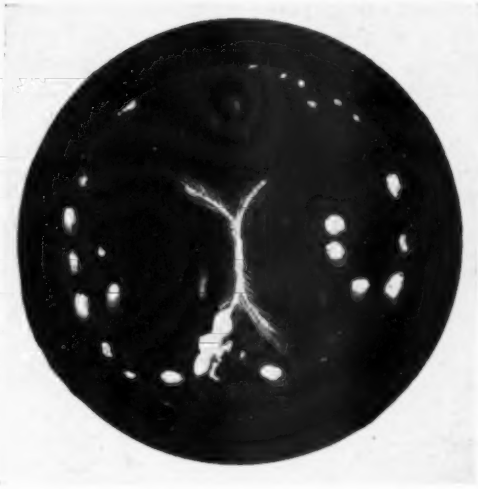

Figure 13. Case no. 661–1921. (Same eye as in figure 14.) **Coronary cataract. Cataract of senile sutures.** Composite drawing of cataractous anterior senile sutures and adjacent area of anterior band of adult nucleus. Coronary plaques shown about nuclear surfaces. Oc. 2. Obj. A_3. Mag. x 35.

two lenses is similar. The right lens is shown in two views in figures 13 and 14. The anterior senile suture is opaque and of a blue color—one might say a sky-blue. The plaques near by are white to bluish-white, while those more distant contain some brown pigment. Under higher power the fine secondary sutures look like fine shimmering icicles standing out from the main suture. The secondary sutures have also a bluish reflex. In the optical section the plaques are found extending on either side of the senile surface. Those of the posterior pole extend somewhat further into the cortex than those of the anterior. This pathological condition was no doubt caused by a disturbing condition existing in late intrauterine life and continuing until shortly after the beginning of cortical development.

Anterior and posterior cortical cataract Complicated cataract

Case no. 53601. Mrs. Wm. C., aged forty-nine years, came to the refraction clinic of the university dispensary November 19, 1924. The patient gave a history of having poor vision since eight years of age, at which time she had repeated "attacks of sore eyes". Since the age of nine years she has always been well.

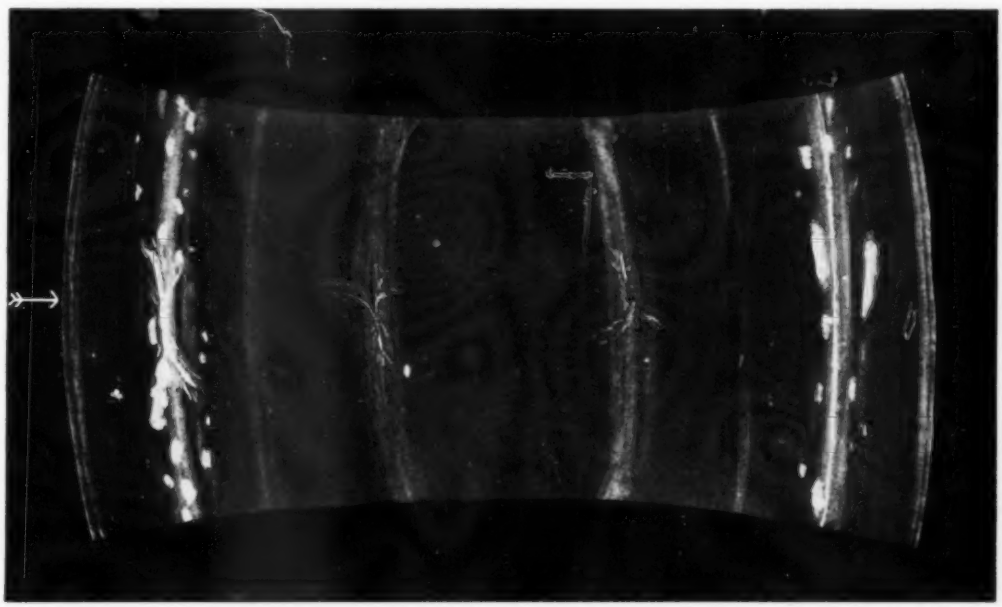

Figure 14. Case no. 661–1921. (Same eye as in figure 13). **Coronary cataract. Cataract of senile sutures.** Optical section showing coronary plaques about the surfaces of separation of the adult nucleus. Also opacities about the anterior sutures of the adult nucleus. Arrow indicates direction of light bundle. Oc. 2. Obj. A_3. Mag. x 35.

Physical examination now negative. Wassermann negative. Eye examination shows: O. D. V. 3/60. Sac, puncta, and lids negative. Palpebral and bulbar conjunctiva show moderate chronic injection. Cornea clear, but oblique illumination shows fine white striae of an old interstitial keratitis. Anterior chamber negative. Iris atrophic, pupil irregular and does not give direct consensual or accommodative reflex. Iris bound down to lens capsule, and there is some old organized exudate about its margin. Lens shows striate opacities. O. S. V. 1/60. Otherwise examination same as right. (See schema, figure 15.) Fundus in either eye seen only indistinctly, but vitreous opacities and old choroiditis made out. Refraction: O. D. −10.00 sph. −1.00 cyl. ax. 180°, V. 6/20; O. S. −9.00 sph. −2.00 cyl. ax. 180°, V. 3/60.

Biomicroscopic examination of both lenses shows similar opacities. The right eye, having the more concentric pupil, was easier to make a drawing of and is shown in figure 16.

Figure 15. Case no. 53601. (Optical section of right eye shown in figure 16.) **Anterior and posterior cortical cataract.** Sketch of right and left eyes to show ophthalmoscopic appearance of lens opacities as noted with the ophthalmoscope with +7.D. lens.

In view of the local findings and of the history it is safe to say that this woman had an iridocyclitis and an interstitial keratitis—probably specific—in childhood; and that the lenticular opacities were secondary and would thus come under the diagnosis of com-

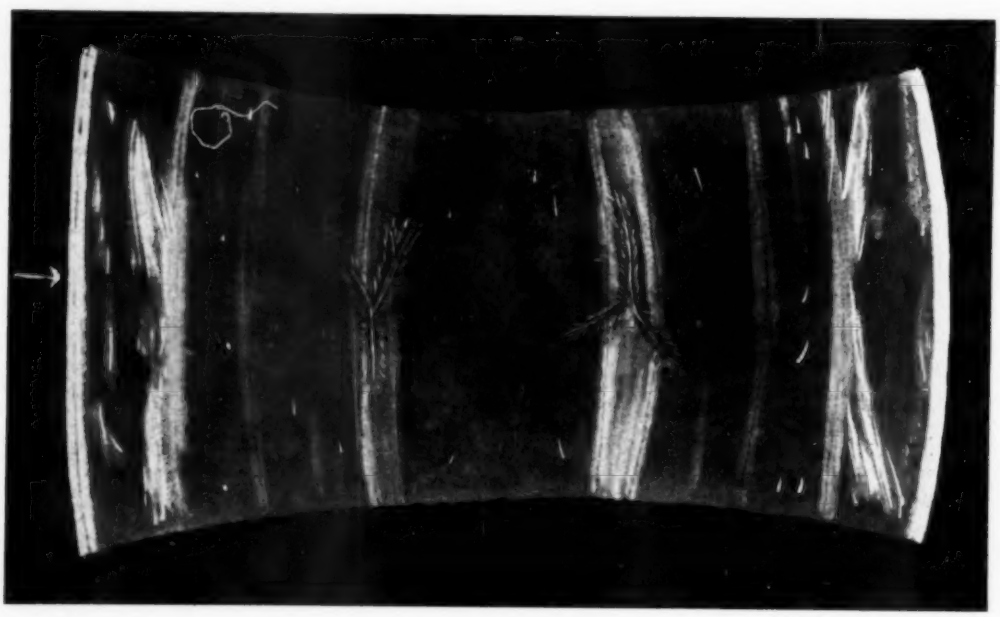

Figure 16. Case no. 53601. (Right eye in figure 15.) **Anterior and posterior cortical cataract.** Composite drawing of optical section of right eye. Opacities found mostly in cortex and about the discontinuity of the senile nucleus. Spoke formations are to be interpreted as extending out into planes above lines indicating margins of senile nucleus. Oc. 2. Obj. A_3. Mag. x 35.

plicated cataract. Also, from the history of long continued unchanged low vision and the cortical location of the

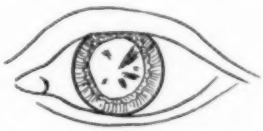

Figure 17. Case no. 54102. (Same eye as in figures 18, 19, and 20.) **Incipient cataract. Senile cataract.** Sketch showing ophthalmoscopic appearance of lenticular opacities with +7 sph. Figures 16 and 17 are drawn for comparison with figures 18 and 19 to bring out the difference in detail of the results of the methods of examination.

opacities, one would in addition classify this as an anterior and posterior cortical cataract.

Incipient cataract
Senile cataract

Case no. 54102. Mr. C. L., a laborer aged sixty-five years, was referred December 15, 1924, by the department of internal medicine on account of lowered vision. Except for a moderate hypertension, physical examination was negative for his age.

Examination showed: O. D. V. 6/36, O. S. V. 6/36. Examination of the eyes was otherwise negative, except for fine lenticular opacities which did not seem to be in proportion to the lowered vision. Referred for refraction. Diagnosis, incipient senile cataract.

Figure 18. Case no. 54102. (Same eye as in figures 17, 19, and 20.) **Incipient cataract. Senile cataract.** Drawing of appearance of spoke formation of senile cataract as seen through loupe (x8).

Refraction: Distant O. D. +1.00 sph. +0.75 cyl. ax. 165°, V. 6/7; O. S. +1.00 sph. +0.50 cyl. ax. 15°, V. 6/7. Reading Add +2.50, V. Jaeger 0.75 O. U.

Figures 17 to 20 inclusive show a comparison of the examination of the opacities in the right eye by different methods. This brings out the definite advantage of microscopic examination over older methods. Compare figures 17 and 18 with 19 and 20.

Gray cataract

Case no. 43–4–46. G. K., a man aged thirty-eight years, came for examination for glasses, on account of dimness of vision. The history was negative.

External examination showed that the iris of the right eye was gray and almost without pigment, and that of the left brown and deeply pigmented. There was a low-grade iridocyclitis in each eye. The left lens had a slightly

Figure 19. Case no 54102. (Same eye as in figures 17, 18, and 20.) **Incipient cataract. Senile cataract.** Composite picture of the biomicroscopic appearance of the spoke formation of an incipient senile cataract. a, showing water-slits in the larger spokes. Oc. 2. Obj. A_2 Mag. x 23

milky gray appearance and there were a few small subcapsular opacities. Refraction showed: O. D. V. 6/60, +2.25 sph. +7.50 cyl. ax. 90°, V. 6/18; O. S. V. 3/60, +2.00 sph. +7.00 cyl. ax. 90°, V. 6/60.

Microscopic drawings were made of the right eye, as shown in figures 21 and 22. In order to obtain a better clinical picture, an optical section was selected near the center of the lens, opposite two subcapsular opacities, and the intermediate area filled in. This gives the opacities and their projected shadows into the lens substance. The other

drawing brings out the mostly clear posterior portion of the lens and a section of the vitreous to show deposits of corpuscular bodies on the supporting structure of the vitreous (the latter being present in cases of cyclitis). Whether these findings are typical of the incipient cataract often found in the nonpigmented eye the writer is unable to say. The observations of other cases will have to be recorded to find the tendency to type in these cases.

Figure 20. Case no. 54102. (Same eye as in figures 17, 18, and 19.) **Incipient cataract. Senile cataract.** Composite drawing of optical section of right lens. Opacities average eighty percent in association with cortex. Opaque areas representing cataract formation are drawn slightly to right and left to indicate different level. Note pronounced reflections of all surfaces of separation. Oc. 2. Obj. A_3. x 35.

Intumescent cataract

Case no. 53758. Mr. T. C. J., a farmer aged seventy-one years, came to the dispensary November 26, 1924, with bilateral senile cataract. O. D. V. 1/6, O. S. V. counting fingers at one foot. He was admitted to the university hospital, and the left eye operated for cataract November 30, 1924. Later he was given 6/6 vision with correction.

On February 14, 1925, he reported that two mornings previously he had "bumped his eye" (unoperated eye) on a chair while lacing his shoe. Since then the eye had been somewhat red and painful.

Examination showed moderate ciliary injection, anterior chamber slightly shallow, and tonometer reading 26 mm. The lens was somewhat more opaque than at previous examination, the striæ being gray-white, glistening, and denser.

Microscopic examination showed swollen bundles of lens fibers as seen in figure 23. These, contrasting with the less involved portions of the anterior lens surface, give a picture of intumescent cataract.

Mature cataract
Toxic cataract

Case no. 55756. Mr. F. B., aged fifty-four years, reported at the dispensary March 30, 1925, for examination of the eyes on account of rapidly failing vision. He has always had good health up to about two years ago, when on account of pyorrhea he was advised to have his teeth extracted. This was done under general anesthesia, the teeth

all being removed at one time. The patient states he became very ill and had to remain in the hospital for two weeks on account of toxemia. Shortly after this he noticed dimness of vision in the right eye, and after a few months beginning dimness in the left.

Examination showed: O. D. V. light projection. External examination negative except the lens, which is opaque. Iris throws no shadow. Light through red green and blue glass shows good color perception. O. S. V. 6/18. External examination negative except cloudy lens.

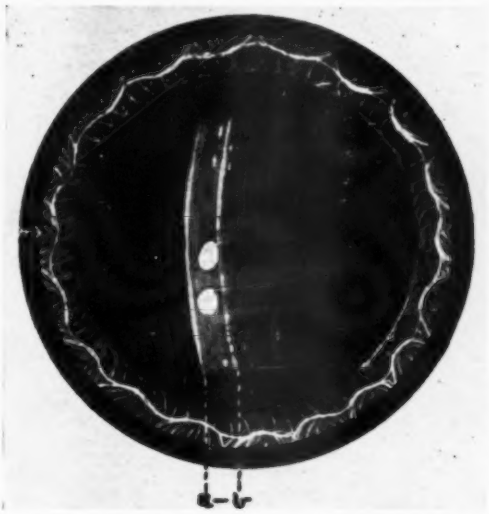

Figure 21. Case no. 43–4–46. (Same eye as in figure 22.) **Gray cataract.** Drawing to show the appearance of anterior half of optical section of right lens of a case of gray cataract. a, b, lines representing reflex of anterior capsule with beam of light in two positions. Interval drawn in to show two large subcapsular opacities with their projected shadows. Entire lens has a slightly milky gray appearance. Oc. 2. Obj. A. Mag. x 35.

Red reflex of fundus seen, but details not made out. Physical examination negative. Diagnosis, mature cataract O. D., incipient cataract O. S. On account of the history of this case a diagnosis of cataract caused by toxemia secondary to focal infection might be made.

Figure 24 gives the appearance of the mature right lens in so far as a drawing of the optical section could be made. Notice the vacuoles immediately beneath the capsule. Only the anterior fourth can be seen, in spite of the good penetrating power of the slit-lamp bundle and the high magnification used.

Figure 22. Case no. 43–4–46. (Same eye as in figure 21.) **Gray cataract.** Drawing to show appearance of posterior half of optical section and anterior vitreous of gray cataract. a, Iris. b, posterior cortex. c, the single opacity of posterior cortex. d, posterior capsule. e, area between lens and vitreous. f, anterior limiting membrane of vitreous. g, corpuscular deposits on fibers of vitreous found in cases of present or past cyclitis. Oc. 2. Obj. A_2. Mag. x 35.

Hypermature cataract
Senile cataract

Case no. 31989, Mr. L.D.A., aged sixty-nine years, reported to the university dispensary April 6, 1925. He com-

Figure 23. Case no. 53758. **Intumescent cataract.** Composite drawing representing anterior view of right eye with focal illumination. Shows bundles of swollen radiating fibers. Fibers not yet swollen fill the darker areas. Oc. 2. Obj. A_2. Mag. x 23.

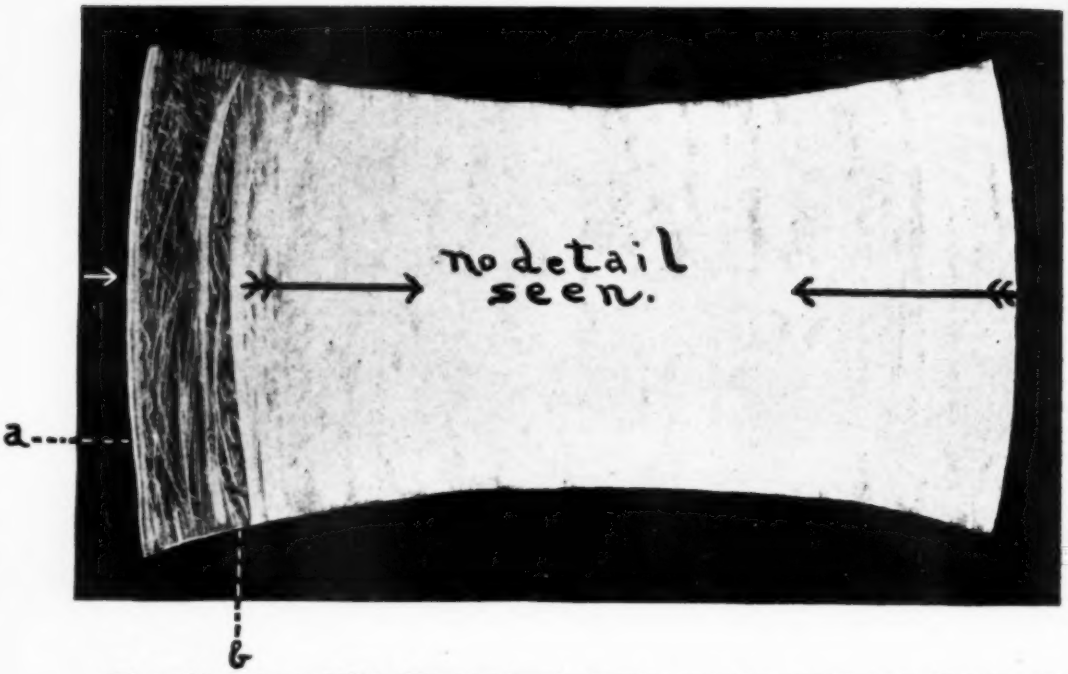

Figure 24. Case no. 55756. **Mature cataract.** Drawing and schema to illustrate limited detail and deepest penetration with high magnification in mature cataract. (Maturity diagnosed by external examination.) Notice vacuoles appearing on anterior lens surface beneath capsule. Oc. 4. Obj. A_2 Mag. x 40.

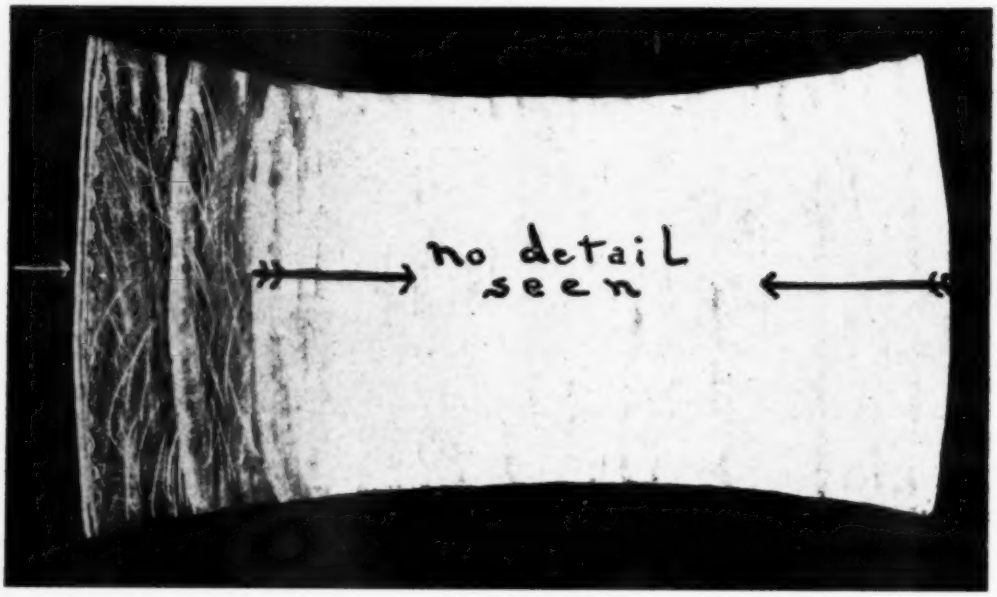

Figure 25. Case no. 31989. **Hypermature cataract. Senile cataract.** Drawing and schema showing deepest penetration (compare figure 24) in hypermature cataract. a, vacuoles of Morgagni. b, fissures forming spheres of Morgagni. Oc. 4. Obj. A_2. Mag. x 40.

plained that it was becoming increasingly difficult to carry on his work as a stock clerk, on account of poor vision. He had had divergent strabismus as long as he could remember.

Figure 26. Case no. 1155. **Congenital cataract.** Schema of ophthalmoscopic appearance at 33 cm. for comparison with figure 27. Dark central areas within dilated pupils represent shadows of opacities confined to embryonic nucleus.

Always had good health. Had had cataract in the left eye—nonfixing eye—for several years. Physical examination reported negative for his age. Some bad teeth need extraction.

Eye examination showed: O. D. V. 6/9–1. Negative except for fine lenticular opacities. O. S.: V. light perception. Lens entirely homogeneous and opaque. No fundus reflex. No shadow from iris. Divergence 30° on perimeter. This left lens was used for drawing to show the biomicroscopic appearance of a hypermature cataract (fig. 25.)

In optical section, then, we first note the uninvolved lens capsule, immediately beneath which are forming small vacuoles. Deeper in, at the corticonuclear junction, we find complete separation of the lens fibers by coagulated fluid (spheres of Morgagni). A continuation of this degenerative process will produce a morgagnian cataract. Slit-lamp bundle will not penetrate senile nucleus.

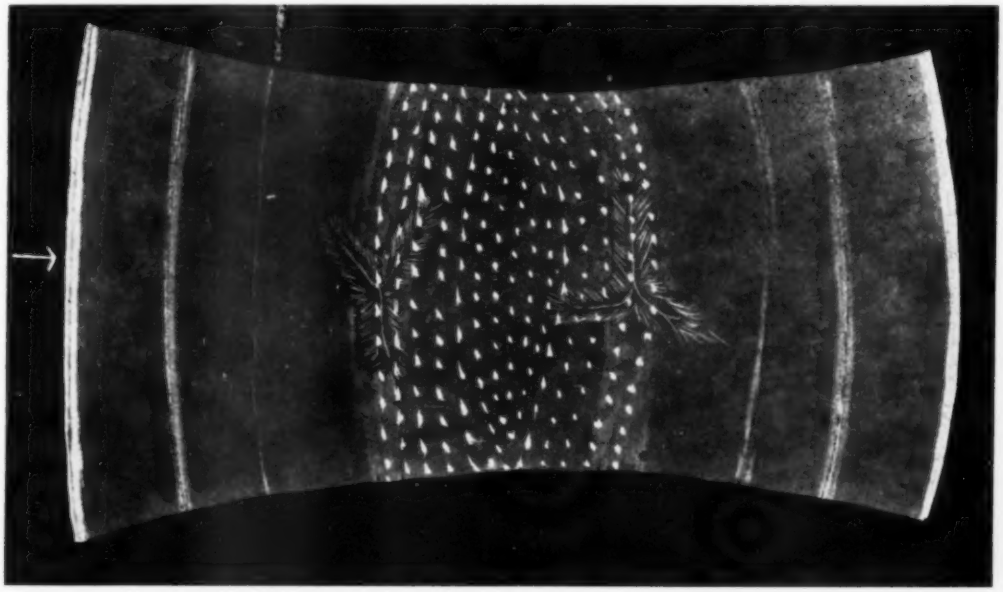

Figure 27. Case no. 1155 (Right eye of figure 26.) **Congenital cataract.** Drawing of optical section of right eye showing a case of congenital cataract confined to the embryonic nucleus. Arrow indicates anterior surface and direction of light bundle. Oc. 2. Obj. A_2. Mag. x 23.

Congenital cataract

Case no. 1155, of the Students' Health Service of the University of Minnesota, was examined and drawings

made on October 24, 1924. This young man, N. A., aged nineteen years, a student at the university, was unaware that he had any ocular abnormality until entering the university in the autumn of 1923. He was referred to the Health Service on account of somewhat lowered vision. He had always been well and gave a negative family history. Eye examination was negative throughout, with the exception of fine dot-like opacities (fig. 26) in the nucleus of either eye. Vision 5/6 in each eye, unimproved with glasses.

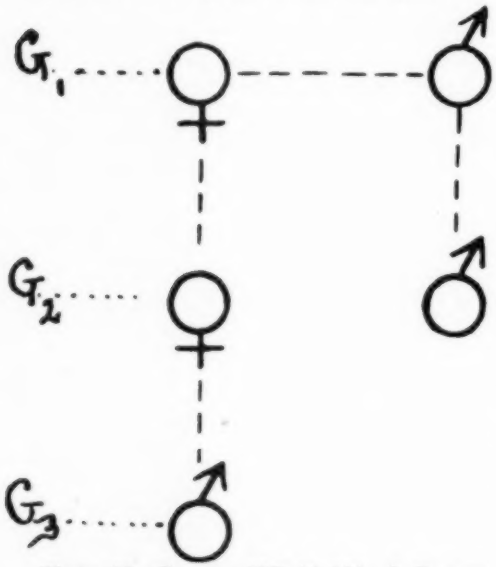

Figure 28. Case no. 57B–14–134. A diagram illustrating the distribution of occurrence of congenital cataract (of similar type) in a single family G_1, G_2, and G_3, successive generations of the family. Direct line of descent indicated by the vertical lines, collateral lines of descent indicated by the horizontal lines. Males, ♂; Females ♀.

The fact that these opacities are confined within the area between the anterior and posterior embryonal sutures immediately makes the diagnosis apparent. (Figure 27.) In any case, by this method of examination a lens opacity may be located easily and definitely, with every advantage over the parallactic method with the ophthalmoscope.

From recent studies in embryology it is the writer's opinion that this particular type of cataract stops in its development at the end of the third fetal month, because of increased nutrition secondary to new vascularization. This is in accord with the belief of Gifford[38].

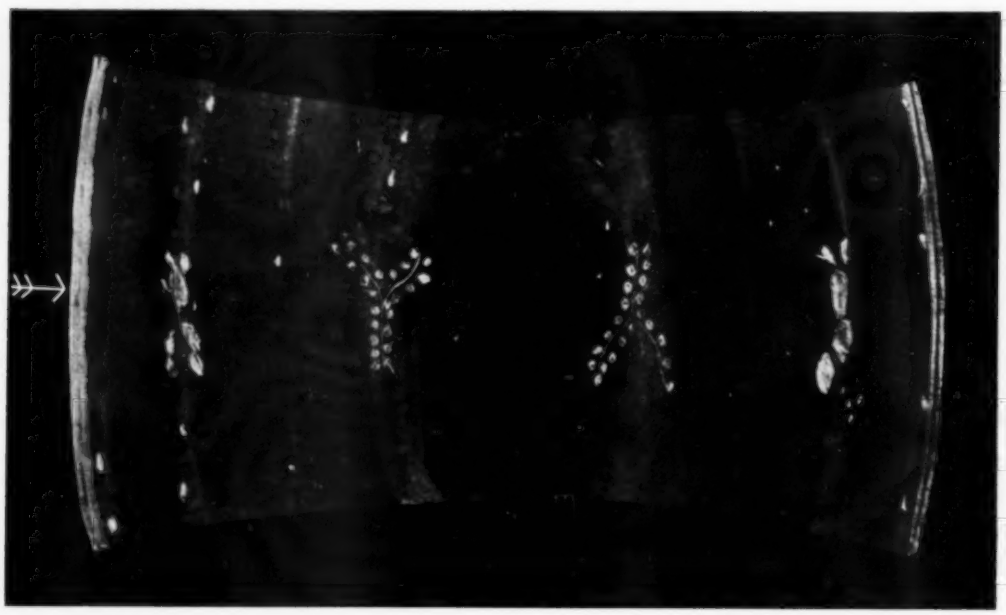

Figure 29. Case no. 57B–14–134. (Same eye as in figures 30, 31, and 32.) **Congenital cataract.** Composite drawing of optical section of case of congenital cataract involving lens sutures. Note plaque-like opacities about senile sutures and large dot-like opacities bordering embryonal sutures. Oc. 2. Obj. A_3. Mag. x 35.

Figure 30. Case no. 57B–14–134. (Same eye as in figures 29, 31, and 32.) **Congenital cataract.** Drawing with focal illumination in anterior plane to illustrate an unusual case of cataract of the anterior senile sutures. Suture lines (normally invisible) are now opaque and have large globular opacities extending out on either side. Oc. 2. Obj. A_3. Mag. x 35.

Congenital cataract

Case no. 57B–14–134. I. E., male student eighteen years of age, came to the refraction clinic for change of glasses. This patient and members of his family had been under the observation of the eye department of the university, so that a good history was obtained. The known members of his family that have the same type of cataract are illustrated in figure 28. In the first generation (to which it could be traced back) was the grandmother of the patient and her brother; in the second generation the mother and a male cousin. The patient was the only known member of the third generation having lens opacities.

Examination of the eyes showed both to present practically the same picture.

Figure 31. Case no. 57B–14–134. (Same eye as in figures 29, 30, and 32.) **Congenital cataract.** Drawing with focal illumination in posterior plane to illustrate cataract of posterior senile sutures. (Compare with figure 29.) Oc. 2. Obj. A_3. Mag. x 35.

Figure 32. Case no. 57B–14–134. (Same eye as in figures 29, 30, and 31.) **Congenital cataract.** Drawing giving detail of embryonal suture cataract. A few small opacities are seen within the embryonal nucleus. Arrow indicates direction of light beam through lens. Oc. 4. Obj. A_3. Mag. x 40.

Vision was 6/36 in each eye, and the eyes were normal except for lens opacities.

Four drawings of the right eye were made to bring out most effectively the character of this congenital cataract. Figure 29 shows an optical section to illustrate the disposition of the opacities. Figure 30 gives detail of the anterior senile sutures, while figure 31 shows the formation of opacities about the posterior senile sutures. In figure 32 will be found, under higher magnification, detail of the unusual disposition of opacities about the anterior and posterior embryonal sutures.

Congenital cataract
Central dust-like cataract

Case no. 2594—1926. L. K., a school girl of eighteen years of age, was brought by her mother to the Dimmer clinic for examination on account of school report of less than standard vision. No history of eye anomalies could be obtained, and the history of patient and family was otherwise unimportant.

Examination of the eyes showed: O. D. V. 6/12, near V. Jaeger 1.00; O. S. V. 6/8, near V. Jaeger 1.00.

Figure 33. Case no. 2594–1926. (Same eye as in figure 34.) **Congenital cataract. Central dust-like cataract. Anterior embryonal suture cataract.** Drawing showing a congenital type of opacity found on the anterior Y. Note fine powder-like opacities confined to the embryonal nucleus. Oc. 2. Obj. A_2 Mag. x 23.

External examination negative O. U. Retinoscopy showed +0.50 cyl. ax. 90° O. U., which did not improve vision. The fundi showed small scleral crescents and the right fundus contained four nevi to the right of the disc. Similar fine opacities were found in each lens.

Drawings were made to illustrate the microscopic findings in the right eye. Figure 33 shows the embryonal nucleus in optical section. Congenital opacities are shown as found on the anterior suture. The nucleus itself was filled with fine powder-like opacities which Vogt has called cataracta centralis pulverulenta (central dust-like cataract). About and within the upper portion of the senile suture were plaque-like opacities of a coronary cataract (fig. 34).

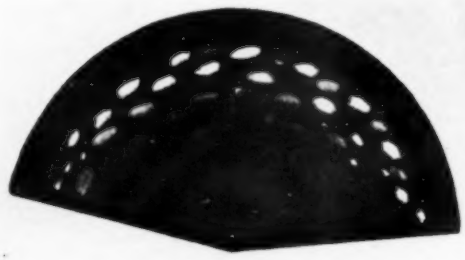

Figure 34. Case no. 2594–1926. (Same eye as in figure 33.) **Congenital cataract. Coronary cataract.** Drawing of upper margin of senile nucleus showing plaque-like opacities of the coronary cataract associated with other types of cataract shown in figure 33. Oc. 2. Obj. A_2. Mag. x 23.

Embryonal equatorial punctate cataract
Senile cataract

Case no. 47–96–46. Mrs. K. S., sixty-seven years of age, came to the clinic on account of poor vision. She stated that during the last year or more she had noticed poorer vision but she believed that otherwise her vision had been nor-

Figure 35. Case no. 47–96–46. (Same eye as in figure 36.) **Congenital cataract.** Drawing of optical section of embryonal nucleus showing ring-like formation of opacities within the nucleus. Viewed from in front with focal illumination the opacities would take on a round disc-like formation. Oc. 2. Obj. A_2. Mag. x 23.

Figure 36. Case no. 47–96–46. (Same eye as in figure 35.) **Senile cataract.** Drawing under focal illumination showing spoke formation of a senile cataract now complicating the congenital cataract shown in figure 35. Oc. 2. Obj. A_2 Mag. x 23.

mal throughout life. Personal and family history negative.

Examination of the eyes showed senile cataract. Left cataract mature. V. O. D. 6/12 +3; near, V. Jaeger 2.00 V. O. S. hand movements. Right fundus negative. During fundus examination a fine disc of opacity was found in the center of the right lens.

Examination of the right lens under magnification twenty-three times showed that the central disc of opacity lay within the embryonal nucleus, and optical section with narrow light bundle showed

Figure 37. Case no. 19–9–45. (Same eye as in figure 38.) **Congenital cataract. Pyramidal cataract. Capsular cataract.** Composite drawing with focal illumination of the anterior surface of the right lens. Lens is entirely opaque except part of cortex. Drawing made with eye looking slightly up and thus showing clear cortex in that direction. Central area of pyramid projected slightly into anterior chamber. Successive steps best illustrated in schema of figure 38. Oc. 2. Obj. A_3 Mag. x 35.

Figure 38. Case no. 19–9–45. (Same eye as in figure 37.) **Congenital cataract. Capsular cataract. Pyramidal cataract.** Schema illustrating optical section through center of cataract as shown in figure 37. Steps of the pyramid brought out best by comparison of the two drawings.

that the cross section of the disc was midway between the sutures and the center of the lens (figure 35). The lower left anterior view of the same lens is shown in figure 36 illustrating the spoke formation of developing senile cataract.

Congenital cataract
Pyramidal cataract

Case no. 19–9–45. Anna E., six-year-old girl, was sent by the family physician

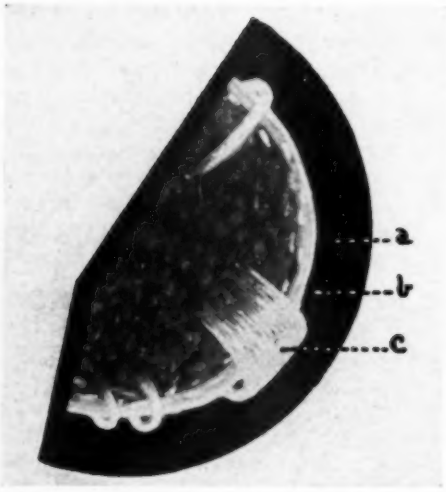

Figure 39. Case no. 19–9–45. (Same eye as in figure 40.) **Congenital cataract. Coronary cataract. "Ryder" cataract.** Composite drawing of cross section of left lens with focal illumination. Shows flake-like and dot-like opacities involving all of lens except cortex. About the inner side of the senile surface of separation are the plaques of coronary cataract. "Ryders" are seen developing in the cortex and extending around peripheral margin. a, margin of dilated pupil. b, narrow clear cortex. c, larger "Ryder". Oc. 2. Obj. A_3. Mag. x 35.

to the Meller clinic for operation. The mother, who brought the child, did not know of any eye abnormalities in the family, although she said her husband was somewhat near-sighted. The brother of the patient, a boy of four years of age, was examined and his eyes found normal. As the family lived at some distance, the father could not be examined.

Examination of the eyes showed: V. O. D. counting fingers at two meters (with dilated pupil); V. O. S. 6/24, near V. Jaeger 1.00. External examination negative and eyes otherwise negative except lens opacities. No pathology made out in left fundus. Diagnosis of congenital cataracts was made.

Microscopic findings in the right lens, so far as they could be seen, are illustrated in drawing (figure 37), and schematically (figure 38). The central area projected somewhat forward to the lens surface, and broadened out backward in succeeding steps until the area of the senile surface of reflection was reached. Clear narrow cortex was found extending past the lens meridian. In the left lens (figures 39 and 40) the

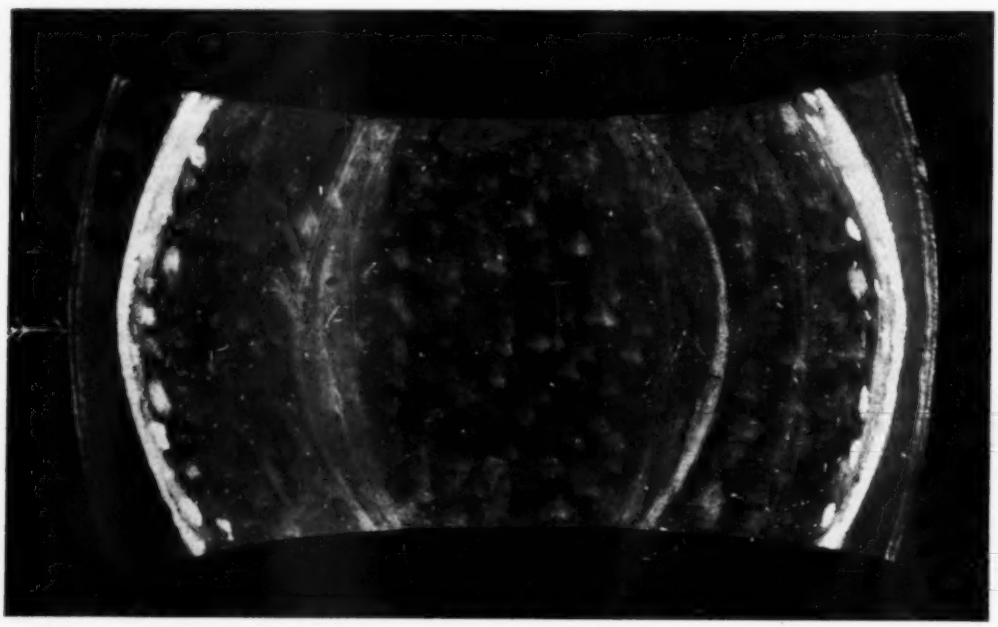

Figure 40. Case no. 19–9–45. (Same eye as in figure 39. Figures 37, 38, 39, and 40 are all from the same patient.) **Congenital cataract.** Drawing of optical section to show relative location of opacities and surfaces of separation in the left eye of a six year old child. Note narrow cortex of childhood as well as inequality of depth. Oc. 2. Obj. A_3. Mag. x 35.

cortex was clear except about the meridian, where four opacities ("Ryder" cataract) had developed forming partial circles about the partly opaque nucleus. Except for the denser area near the surface of the nucleus, and the plaques found mostly above, the opacities were of fine powder-like type and arranged in cloud-like groups.

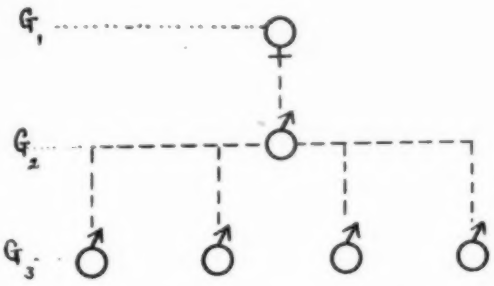

Figure 41. Cases no. 3005–1923, 3006–1923, 1611–1923, 1610–1923 and 1612–1923. (Figures 42 to 49 inclusive.) A diagram illustrating the distribution of occurrence of congenital cataract (of similar type) in a single family. G_1, G_2, and G_3, successive generations of the family. Direct line of descent indicated by the vertical lines, collateral lines of descent indicated by the horizontal lines. ♂ Males, ♀ Females.

Congenital cataract
Axial embryonic cataract

The case, no. 3005—1923, of Joseph E., fifty-three years of age, will be reported with that of his oldest son, Karl E., aged twenty-four years (case no. 3006—1923). Both father and son have exactly the same eye findings. The history of this family is interesting in that the father, his mother, and his four sons all have congenital lens opacities of similar type. Figure 41 gives a diagram illustrating the congenital descent of cataract in this family.

The father's and son's eyes are normal except for an axial embryonic cataract in each eye. Refraction of father: O. D. V. 6/7, +0.50 sph. V. 6/6 O. S. V 6/9, +0.50 sph. V. 6/6.

Reading addition +1.50 O. U., V. Jaeger 1.00. Refraction of son: O. D. V. 6/6, +0.50 sph. V. 6/6; O. S. V. 6/6, +0.50 sph. V. 6/6.

A drawing (figure 42) of the optical section of the embryonal nucleus of the right eye of the father shows the location of the opacities. These appeared in the binocular field as small globes filled with numerous small gray and white granules.

Congenital cataract
Anterior embryonal suture cataract

Case no. 1611—1923, Joseph E. Jr., aged twenty-three years, second son of family illustrated in figure 41. Personal history unimportant. Family history given under that of the father (case no. 3005—1923). Eye examination except lens opacities. Refraction shows no error of moment. Refraction: O. D. V. 6/24, +4.50 sph. V. 6/6; O. S. V. 6/60, +4.50 sph. V. 6/8. Microscopic examination of the right eye shows opacities on the anterior embryonal suture as shown in figure 43. Here four round semitransparent globes are found on the suture. The globes are filled with granular gray-white opacities and the two upper ones have radiating linear opacities extending outward. The left eye, also shown in optical section (figure 44), shows three somewhat larger globular bodies containing granules and radiating lines.

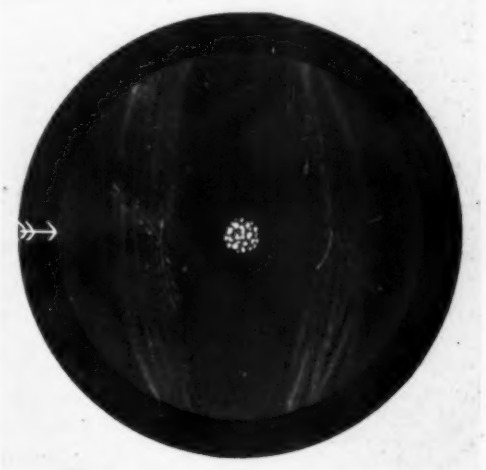

Figure 42. Case no. 3005–1923. **Congenital cataract. Axial embryonic cataract.** Drawing of optical section of embryonal nucleus of right eye. A small globe of many opacities located in exact center of lens. Left eye same as right. Lenses otherwise normal. Oc. 2. Obj. A_3. Mag. x 35.

Congenital cataract
Anterior embryonal suture cataract
Embryonal shell cataract

Case no. 1610—1923. Franz E., aged twenty years, son of family illustrated in figure 41. Personal history unimportant. Family given under that of the father (case no. 3005–1923). Eye examination negative except congenital lens opacities. Refraction; O. D. V. 6/8, +0.50 sph. V. 6/8; O. S. V. 6/24, +1.00 sph. V. 6/24; reading O. D. V. Jaeger 1.00, O. S. V. Jaeger 6.00

Microscopic examination of right eye is negative, except one globular opacity

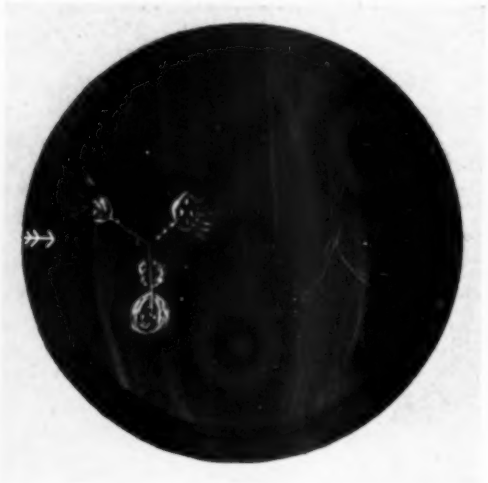

Figure 43. Case no. 1611–1923. **Congenital cataract. Anterior embryonal suture cataract.** Drawing represents optical section of right eye showing anterior embryonal suture cataract. Rounded opacities on suture appeared through binocular microscope as round semitransparent globes containing granular opacities and radiating lines. Oc. 2. Obj. A_3. Mag. x 35.

on the lower branch of the embryonal suture. This is illustrated in figure 45. The left eye shows a complicated picture which differs somewhat from those of the rest of the family. Figure 46 gives an anterior view of the lens showinga shell-likedense opacity following the senile surface of reflection throughout nearly three-fourths of its circumference. The cortex was clear throughout, as was the remainder of the nucleus with the exception of the anterior embryonal suture. On optical section with the light bundle entering from left and

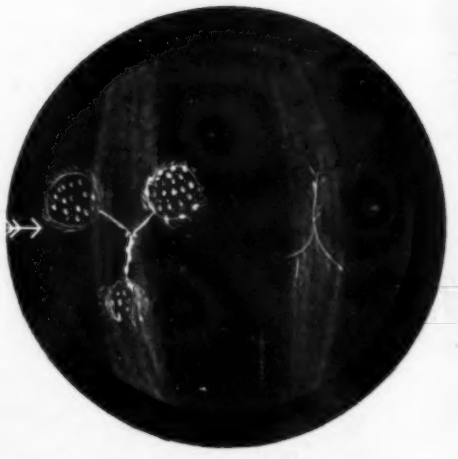

Figure 44. Case no. 1611–1923 (left eye). **Congenital cataract. Anterior embryonal suture cataract.** Drawing of optical section through embryonal nucleus of left eye. To binocular vision the rounded opacities appeared as globes. Each globe contained granular opacities in its surface as well as throughout the interior. From the surface extended fine gray lines. Oc. 2. Obj. A_3. Mag. x 35.

right one could study the embryonal surfaces and sutures as well as the interior of the shell. The anterior embryonal sutures carried three globes similar to that of the brothers and father.

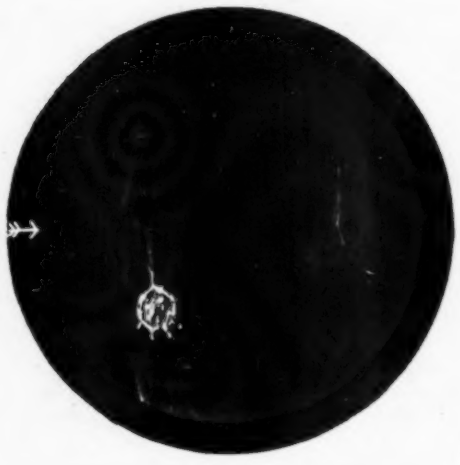

Figure 45. Case no. 1610–1923. **Congenital cataract. Anterior embryonal suture cataract.** Drawing illustrating optical section through embryonal nucleus of right eye showing single globule on lower arm of suture. Oc. 2. Obj. A_3. Mag. x 35.

Figure 47, drawn to represent a cross section of figure 46 through a–a′, gives a good illustration of the extent and distribution of the opaque areas.

Congenital cataract
Anterior embryonal suture cataract

Case no. 1610—1923. Otto E., aged nineteen years, fourth son of family illustrated in figure 41. Personal history unimportant. Family history given under that of the father (case no. 3005—1923). All the family have brown irides except this boy, who has blue. Eye examination negative except congenital lens opacities. O. D. V. 6/6, O. S. V. 6/6. Error of refraction +0.50 sph. O. U.

Figure 46. Case no. 1610–1923 (left eye). **Congenital cataract. Anterior embryonal suture cataract. Embryonal shell cataract.** A composite drawing of an unusual congenital cataract showing the anterior embryonal suture cataract of patient's family as well as an opaque area throughout a greater portion of the senile surface of separation. A schematic cross section from *a* to *a′* shown in figure 47. Oc. 2. Obj. A_2. Mag. x 23.

Microscopic examination of the right eye shows three large globular opacities on the anterior embryonal suture. Optical section of the embryonal nucleus is shown in figure 48. The eye was otherwise normal. In the left eye was a single rounded opacity directly behind the anterior embryonal suture. This anterior axial embryonal cataract is illustrated in figure 49.

Figure 47. Case no. 1610–1923 (left eye). **Congenital cataract. Embryonal shell cataract.** Schema to better illustrate extent of opacities as drawn in figure 46. Schema represents cross section of lens through *a* to *a′* in figure 46.

Senile cataract

Case no 52609 is here presented as one of uncomplicated senile cataract in the early stages of development. The patient, Miss M. C., aged sixty-two years, has always had good health. Family and personal history negative. She recently came to the dispensary

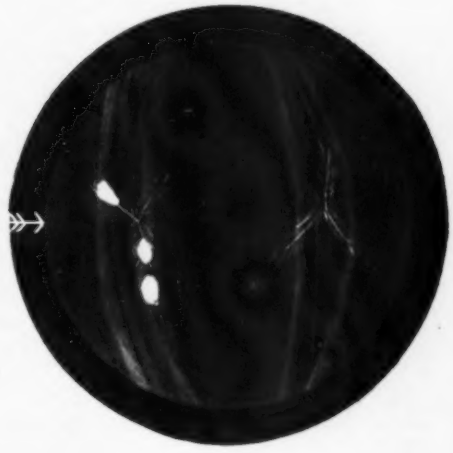

Figure 48. Case no. 1612–1923. **Congenital cataract. Anterior embryonal suture cataract.** Drawing of optical section of embryonal nucleus of right eye showing one opaque mass on right upper arm, and two on lower arm of anterior embryonal suture. Oc. 2. Obj. A_3. Mag. x 35.

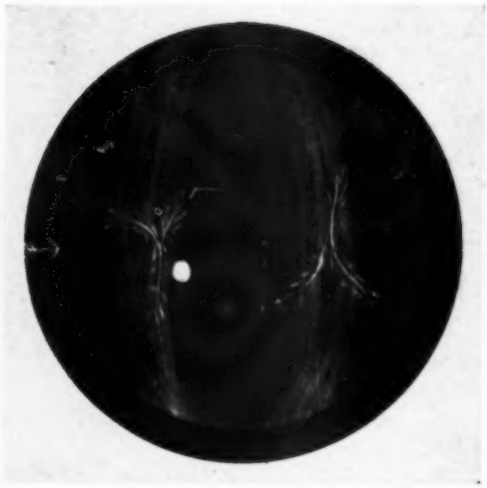

Figure 49. Case no. 1612–1923. **Congenital cataract. Anterior axial embryonic cataract.** Drawing of optical section of embryonal nucleus of left eye showing small opaque mass immediately behind the anterior embryonal suture. Oc. 2. Obj. A_3. Mag. x 35.

on account of a minor complaint. Physical examination practically negative for age, but was referred to the eye department on account of lowered vision.

Examination shows: O. D. V. 6/60, O. S. V. 6/30. External examination negative except for lenticular opacities. Ophthalmoscope shows distinct radiating spokes forming sectors. Fundi indistinct but negative. Patient has worn glasses for twenty and bifocals for twelve years. Refraction: Distant, O. D. −2.00 sph. −2.25 cyl. ax. 90°, V. 6/30; O. S. +1.00 sph. −2.25 cyl. ax. 90°, V. 6/7; reading addition +2.50 sph. O. D. V. Jaeger 1.25, O. S. Jaeger 0.50.

Figure 50 shows the right lens in optical section. The newer method of examination brings out the posterior stellate figures very distinctly and definitely locates all opacities. The high refractility of a lens at sixty-two years may be noted.

Diabetic cataract

Case no. 49387 represents an uncomplicated diabetic cataract. The patient, Mr. E. G., a farmer aged sixty-one years, came to the dispensary on June 5, 1924, at which time a diagnosis of diabetes was made. No record of vision was made at that time. On November 16, 1924, he came in from the farm on account of

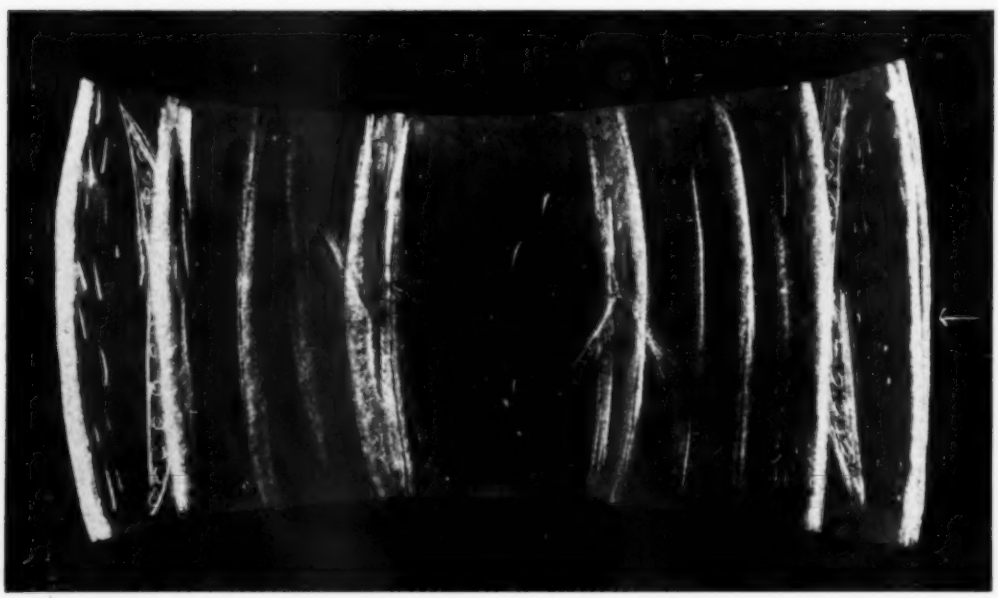

Figure 50. Case no. 52319. **Senile cataract.** Drawing of optical section through right lens of woman sixty-two years of age. Shows opacities of beginning uncomplicated senile cataract. Apex of spoke formation should be interpreted as in same plane as base. Approximately eighty percent of opacities are in cortex. Note density of surfaces of separation. Oc. 2. Obj. A_3. Mag. x 35.

Figure 51. Case no. 49387. (Same eye as in figure 52.) **Diabetic cataract.** Composite anterior view showing opacities drawn under focal illumination. Case of incipient diabetic cataract. Compare with figure 52. Oc. 2. Obj. A_2. Mag. x 23.

increasing dimness of vision which materially interfered with his work.

Examination shows: O. D. V. 3/60. External examination negative except lens, which shows opacities. With loupe (x8) and oblique illumination anterior cortex is seen to be fairly clear. Radiating sectors are forming. Tension with tonometer is 22 mm. Fundus negative. O. S. V. hand movement at ten cm. This eye has been operated on elsewhere for cataract without result. There is incarceration of the iris and a mass of opacities in the vitreous. The eye is now quiet. Refraction: O. D. V. 3/60, +2.50 sph. +2.00 cyl. ax. 165°, V. 6/10.

Microscopic examination of right eye shows there are also fine punctate opacities in what appeared to be clear areas. The posterior half of the lens is more involved. The punctate opacities, as they become more dense, lengthen and form striæ. Many striæ are not confined to the surfaces of separation (see figures 51 and 52). This is found to be the case in most cataracts of diabetic origin.

Traumatic cataract

Case. Sergeant J. O. H., a soldier twenty-one years of age, was brought to the clinic for examination and prog-

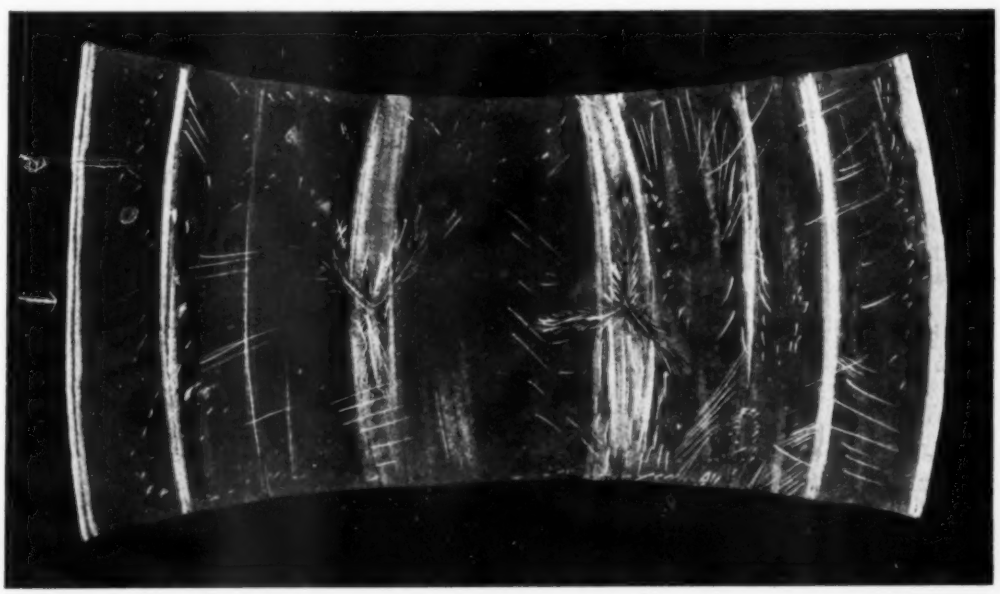

Figure 52. Case no. 49387. (Same eye as in figure 51.) **Diabetic cataract.** Drawing represents optical section through lens and shows disposition of opacities in beginning diabetic cataract. Linear opacities crossing from left to right are to be interpreted as parallel to surfaces of reflection. Appearance of section as represented is that obtained under one focus with Oc. 4. Obj. 55. Mag. x 16. Details of drawing filled in with Oc. 2. Obj. A_3. Mag. x 35.

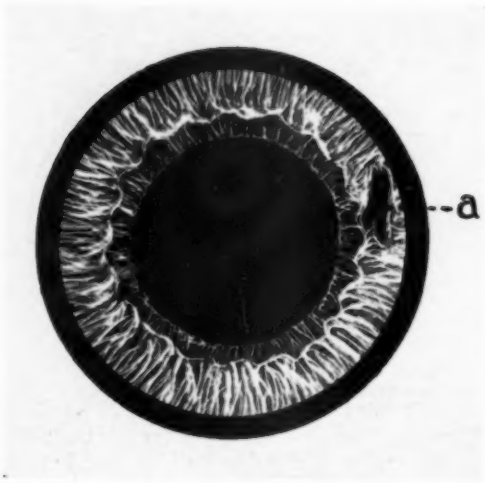

Figure 53. Case from U. S. Army, Fort Snelling. **Traumatic cataract.** Composite drawing of anterior surface of iris and lens under focal illumination. *a*, tear in iris secondary to explosion of can of powder. Iris otherwise normal. Fine opacities shown in pupillary area are secondary to trauma. Compare with figure 54. Oc. 2. Obj. A_2. Mag. x 23.

nosis. On July 23, 1923, the left eye was injured when a can of powder exploded. There was no penetrating injury and the x-ray plate was negative. There was a tear in the left iris from the concussion, which is shown in figure 53. This and some fine lens opacities, which do not seem to account for vision of 6/60, are the only remaining evidences of injury. Transillumination negative. (The right eye was not injured.) The fundus cannot be made out and this indicates more obstruction than accounted for by the fine lens opacities as above noted.

With the aid of the slit-lamp and binocular microscope the exact condition is immediately apparent. The opacities of the lens are found confined to the cortex, and more near the posterior capsule. With better vision, as obtained with more brilliant illumination and higher magnification, a few small areas can be found through which the anterior vitreous may be seen. This is found to contain many opacities. Prognosis for better vision not good.

This case of contusion cataract does not show a picture characteristic of the type. Most cases of traumatic cataract show radiating spoke or linear formations accompanied by waterslits. The drawing in figure 54 was done of course about one year after the accident. It would be interesting to know if air column con-

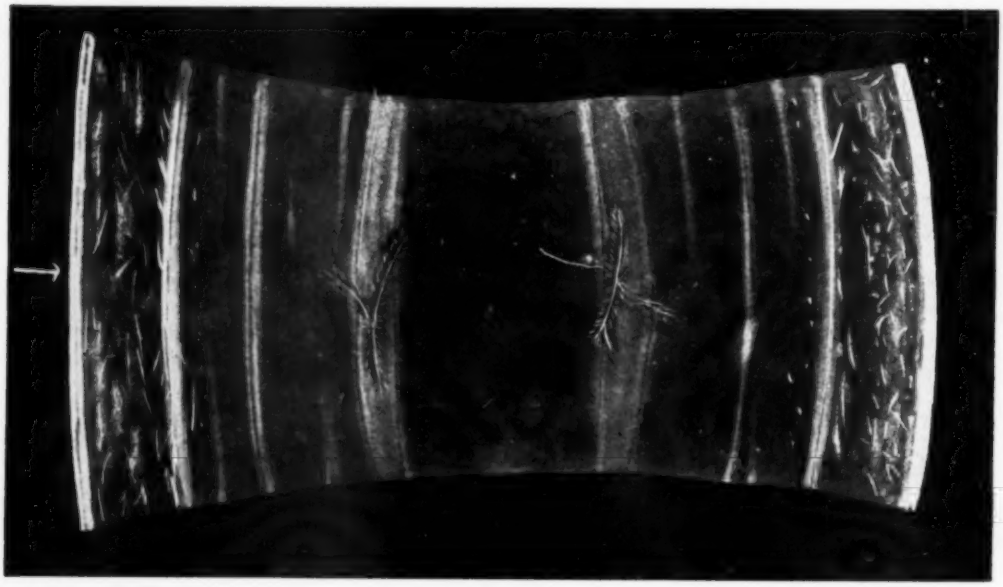

Figure 54. U. S. Army case. (Same eye as in figure 53.) **Traumatic cataract.** Composite drawing of optical section of lens after trauma. This case of concussion trauma gives an entirely different picture from that of contact trauma. Here opacities are mostly in cortex. Oc. 2. Obj. A_3. Mag. x 35.

tusion produces a type different from that of contact.

Electric cataract

Case no. 44–102–104. L. K., aged seventy-one years, came to the Dimmer clinic for cataract operation. He had been struck by lightning six months previously, and had been unconscious for three days. After this there was rapid loss of vision. The patient insisted that he had normal vision up to the time of the accident. Family history negative. Clinical diagnosis, electric cataract.

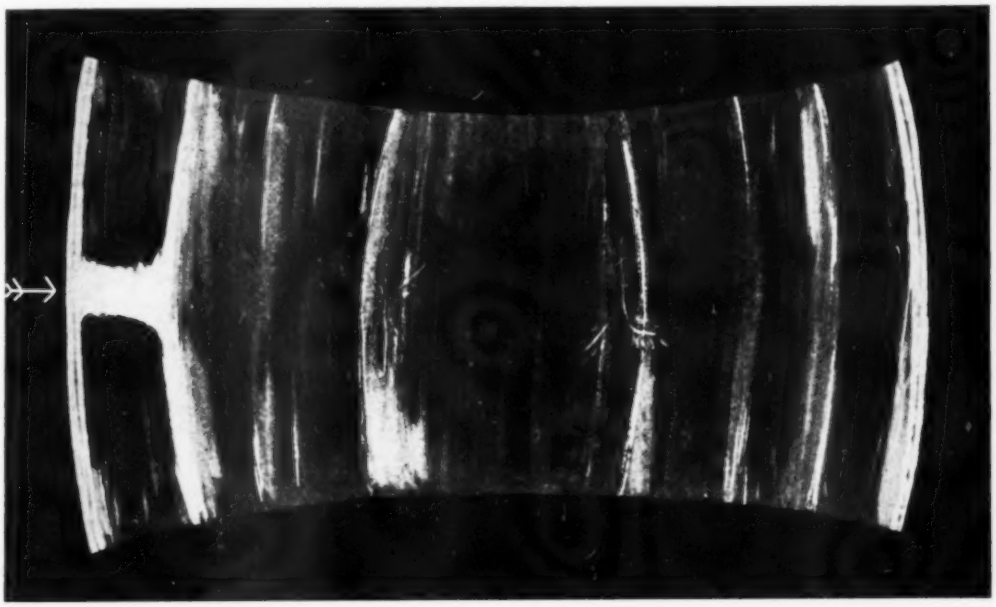

Figure 55. Case no. 44–102–104. **Electric cataract (?).** Composite drawing of optical section of right eye showing lens opacities. Case history was that of electrical cataract. Entire lens somewhat milky gray, with deeper opaque areas extending out from surfaces of separation. A rounded opaque column is seen connecting anterior surface of lens with senile nuclear surface. This would appear to be congenital. Oc. 2. Obj. A_3. Mag. x 35.

At the time of this study the right eye had been operated on two weeks previously and a preliminary iridectomy had been performed on the left eye four days before. Patient counts fingers with each eye at one-half meter.

Optical section shows a picture somewhat different from what was expected. All surfaces (figure 55) of separation were moderately opaque, with more or less cloudy lens fibers adjacent. The entire lens was milky. In the anterior central area was a dense round opaque column of opacity joining the lens surfaces to the senile nucleus behind. This picture might represent a congenital opacity combined with a senile cataract.

There have been reported in the literature about ninety cases of electric cataract; that is, cataracts resulting from lightning or electric shock. Of these reports four contain descriptions of the biomicroscopic appearance. A more detailed one is that of Gjessing,[3] who describes in substance "corkscrew shaped threads and laces, crossing each other in all directions, without following run of the lens fibres." It is to be regretted that drawings of these cases were not made nor technique and magnification given. As yet the present author never found a lens opacity that did not follow the regular run of lens fibers.

After cataract

This subject does not come under the regular classification of cataract, yet much information can be obtained

by study of these cases before performing the operation of discission.

Case no. 54480, in Mr. F. C., aged thirty-seven years, will be used for illustration. This patient received a blow over the right eye, which was followed by traumatic cataract. Operation elsewhere for cataract three years ago was followed by discission. This man came to the eye clinic of the university on January 30, 1925, at which time the drawing (figure 56) was made.

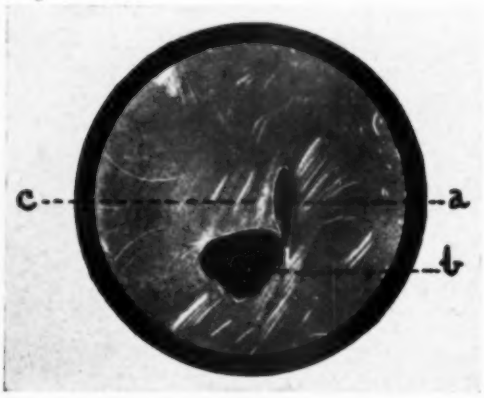

Figure 56. Case no. 54480. **After cataract.** Drawing of anterior view of opacities and posterior lens capsule under focal illumination. *a* and *b*, openings made by discission. *c*, optical center. White lines and areas represent scar tissue formation. Oc. 2. Obj. A_2. Mag. x 23.

Examination of this aphakic eye at first indicated no obstruction to vision, as the pupil was quite black. Further examination with the ophthalmoscope and loupe showed a fine membrane. The exact detail and lines of fine scar tissue were at once exceedingly apparent when viewed with the microscope. At "a" and "b" in figure 56 we see the results of the discission. The patient's vision with correction is now 6/60. As the fundus is normal it seems likely that the obstruction in optical center "c" is the cause of low vision. The operator in any case, with such a preliminary drawing before him, would not be at a loss just where to make discission to obtain the best results.

Conclusions

1. The present classification of cataracts as found in the standard textbooks on ophthalmology will likely be changed as a result of biomicroscopic studies.

2. The multiplicity of terms is to be deplored but these will no doubt be simplified, and their exact meaning standardized by usage.

3. Diagnosis is facilitated by microscopic study of lenticular opacities, and may be classified into three divisions:

(a) those cases in which an exact diagnosis can be made only by this method;

(b) those cases in which the biomicroscopic appearance aids in diagnosis; and

(c) those cases in which there is no further aid to diagnosis.

4. Microscopic study is practical at all times in private practice after the operator has become familar with the use of the instruments; and examination is rapidly done.

5. Treatment of the patient—at least with our present knowledge—is rarely changed as a result of additional data obtained with the microscope. The greatest satisfaction in biomicroscopy is the scientific study obtained by the oculist with these newer instruments of precision.

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